the OIL AND GAS JOURNAL

PUBLISHED WEEKLY

OCT. 12 1959

annual DRILLING number

- THE MOST FROM SURFACE MUD SYSTEMS
- TURNKEY DRILLING— BOTH SIDES OF THE STORY
- ROUNDUP OF ACTIVE DRILLING AREAS

p. 107

Labor Shortage Hits Drilling Contractors p. 83

Oil Rides Out Steel Strike Smoothly p. 86

In a rebuttal article, the scouts say:

The Scout Check Is Not Obsolete p. 90

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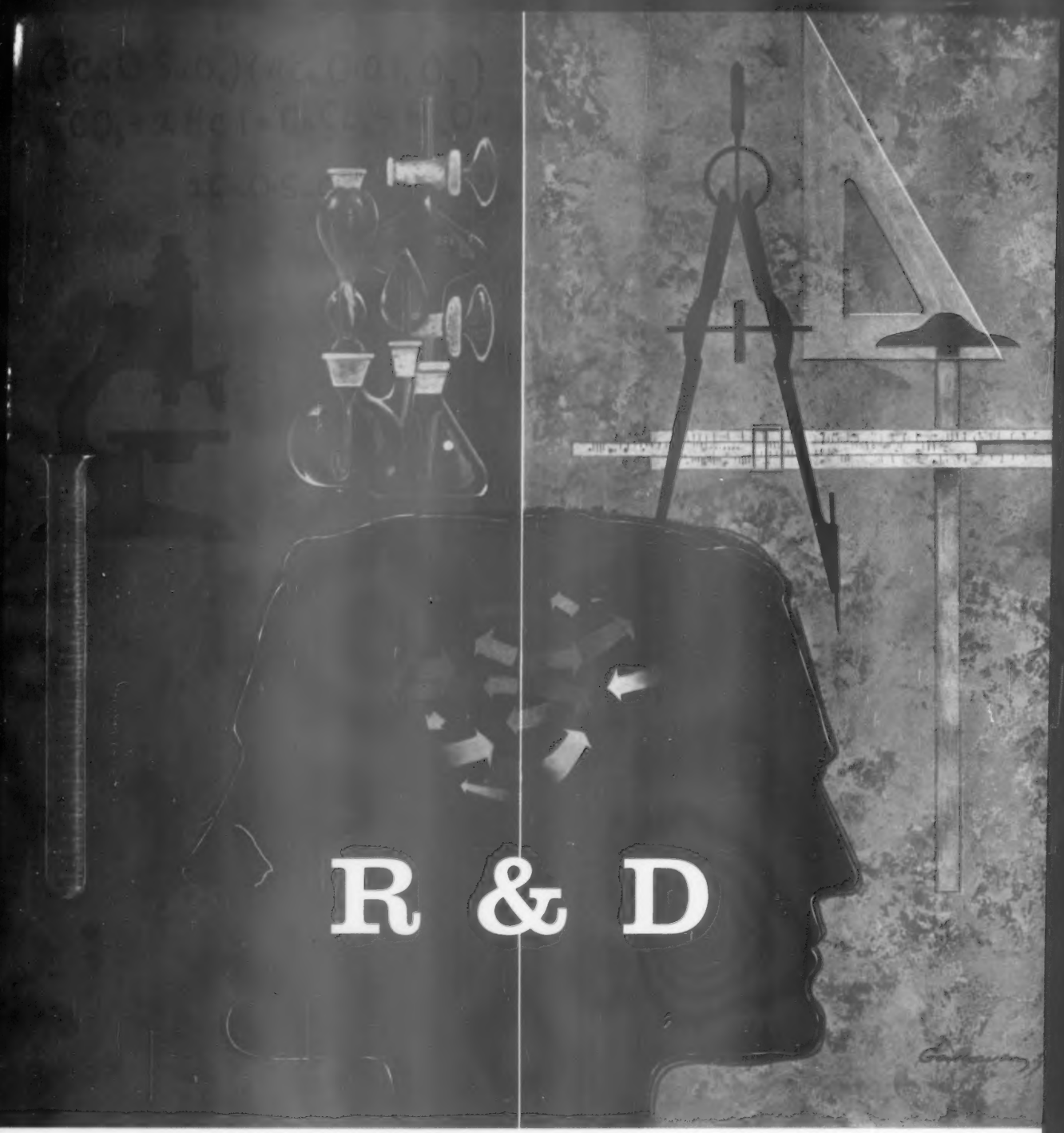

PARTNERSHIP MAKES PROGRESS

An industry can progress only from the basic elements that Research and Development make available to it...

From the idea stage, to the sample, test or prototype phase, and from there into finished product, Halliburton Research and Development are an integrated partnership. They make possible the results that are achieved in the field.

All these things happen because of the blending of many talents of the "men who are making tomorrow."

HALLIBURTON OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

OIL AND GAS JOURNAL
Vol. 57 No. 42

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HOW TO GET THE MOST OUT OF YOUR SURFACE MUD SYSTEM 107

By Ed McGhee

A poor mud system will cost both contractor and operator time and money. Savings result from a well-designed and well-constructed system.

Important Features of Pits and Tanks 108

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THE STATUS OF TURNKEY CONTRACTS 123

There has been a definite increase lately in the number of wells drilled turnkey. Neither contractor nor operator can afford to ignore it. This section outlines what the turnkey contract is, what's new about recent turnkey contracts, advantages, disadvantages, protection for contractor, who provides what, and the future of turnkey drilling.

ACTIVE FIELDS DRILLING REPORT 133

By Peter B. Bike

Here are drilling programs representative of average conditions of the new active fields in the United States. More than 150 firms were surveyed to obtain the necessary data. Over-all costs, rig-time distribution, casing and mud programs, and average formation depth are the indicators used in evaluating an area.

Drilling Contractors Census for 1959 171

By Robert B. Bizal

A new Journal study shows that more than 150 drilling contractors have quit business in the past year. There are now 1,018 drilling contractors in the United States. They operate 3,596 rigs. Drilling contractors in Canada decreased 25% last year, with the total now standing at 61. There are 324 active rigs.

TECHNOLOGY—OPERATION

Humble Attacks Pollution at Baytown—Part 2 172

By Larry Resen

A multipronged attack on air and stream pollution has resulted in marked improvement. The project is continuing even though progress in the past decade has been greater than called for by the original goals.

Phillips Designs and Installs New LACT Instrumentation 177

By L. E. Kuntz

The new packaged equipment means (1) more accurate measurement of fluid properties; (2) initial cost only one-half that of off-the-shelf instruments; (3) fast payout through product savings and elimination of daily attention; and (4) elimination of sampling and sample storage.

How El Paso Natural Maintains Three Types of Cooling Systems 182

By M. J. Crowley

The company operates horizontal reciprocating, vertical reciprocating, and gas-turbine centrifugal stations. Each type requires a different cooling system, and different maintenance techniques are needed in each case.

Process Costimating—58 186

Approximate price indexes of refinery chemicals.

The Foreman's Page 188

Here are tips on applying refractory materials. Part 2 of two parts.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Oct. 12, 1959

Ranks of drilling contractors are thinner:

The Journal's new census of rotary drilling firms shows 1,018 doing business in the U. S. this year.

That's a drop of 169 from the 1,187 firms active last year. Biggest decrease was among the smaller contractors who operated one or two rigs (p. 171).

▼ ▼ ▼

Pinch in steel is beginning. Up to now shortages have not hit domestic drilling operators.

Shortages are appearing in small-dimension casing and tubing, high-strength, thick-walled tubing, line pipe, and heavy steel sheets for high pressure vessels.

Major companies can probably last out the year with little trouble. Independents can make-do for perhaps 30 or 45 days longer.

Reasons why industry has made out so smoothly during 3 months of steel shutdown: Heavy inventories in hands of companies and supply houses; practice of swapping and trading; few mills still running; and poor oil market which does not make drilling too attractive (p. 86).

▼ ▼ ▼

Pinch from another direction is facing drilling men.

Shortage of competent help, especially roughnecks, will hurt contractors when rig activity picks up. Lack of trained men already is showing up in some areas.

Explanation: Low level of drilling activity. Crews of stacked rigs, able to work only half the time, have found other jobs. Other reasons: Inadequate pay and the hard, nomadic life (p. 83).

▼ ▼ ▼

Ownership of oil-rich tidelands will be at stake this week when U. S. Supreme Court hears final arguments in the long struggle (p. 102).

Basic issue: Does state control of mineral rights extend seaward by 3 miles or 3 leagues (about 10½ miles)? At stake is $208 million in bonus money for Louisiana, $30 million for Texas, lesser amounts for other gulf coast states.

The legal test of Texas Railroad Commission's power to force a common purchaser to buy oil has been averted.

A hearing was canceled last week when Texaco decided to buy the oil. Independents were miffed because they considered their case good and wanted to win a precedent (p. 89).

The Washington beat: Panhandle Eastern has won its long fight to abandon service to Michigan Consolidated of Detroit...The President has told New England senators there's no sign of fuel-oil shortage or price hike this winter... Interior Secretary Seaton is urging the gas industry to take the lead in seeking new legislation cutting it away from FPC controls.

▼ ▼ ▼

Midwestern Gas Transmission is serving the Chicago industrial area with gas a month ahead of schedule from its newly completed line from Portland, Tenn. (p. 97).

The 350-mile line began in July. Five pipeline contractors put six spreads on the job, four others did five river crossings, and still another built a compressor station.

Still pending is Midwestern application to import gas from Canada into Minnesota and Wisconsin. FPC has set oral arguments on case for Oct. 20. If FPC approves, Canada's new national energy board is expected to follow suit.

More gas also has reached the Houston industrial area. Humble put its 30-in. line from King ranch into operation.

The 238-mile line is part of a $75-million program to develop gas reserves in 13 southwest Texas fields for sale within Texas. This puts the gas outside FPC control.

▼ ▼ ▼

Scout checks are not being made obsolete by changes now occurring in scouting methods nor is the scout himself a passing character in the oil business.

That's the observation of William P. Allen, president of the international oil scouts. He says the trusted, reliable, and well-informed scout will always be treasured by a company which wants to be prepared to participate in wide-spread leasing and exploration (p. 90).

New well log based on phenomenon of nuclear magnetic resonance has been announced. It stems from a cooperative research program of California Research Corp. and Byron Jackson Division of Borg-Warner Corp.

The log can be used to determine effective porosity and shows the possibility of providing a permeability index which will distinguish between oil and water zones and show saturations in vicinity of bore hole.

The nuclear magnetism log still is in the experimental

stage but has passed a wide variety of field tests. Plans now are to build new tools suited for oil field service.

Major breakthrough within next 5 years in applying geochemistry to surface detection of oil and gas is expected.

Geochemical experts report much research money is now being channeled into the field and interest is increasing.

Success could mean much cheaper exploration and quicker reconnaissance in untried regions.

Major symposium on the subject is scheduled for the Nov. 2-4 annual meeting of Geological Society in Pittsburgh.

Exploration notes: Interest is picking up in Pacific Northwest exploration—three wells drilling, nine surface parties at work in Oregon and Washington...Wyoming's Wind River basin is back in the limelight with Gulf's good gas discovery in North Lysite area...Farmington, N. M., sits atop a gas field and other wells may follow Southern Union Gas' 2 McCord...Delaware basin play may be spread 50 miles southeast by Argo 1 Neal which blew out, flowing both oil and gas at 4,808 ft....Kentucky's shallow play has a real blow out—the Linehan 1 Slate in Simpson County went out of control 5 hours, then was rated at 792-bbl. daily from 497 ft. (p. 101)... Williston basin has remote discovery in Mobil F-44-20 Mueller in northeastern Montana...Shell-BP apparently has a good strike in Nigeria after 5 years of unsuccessful wildcatting (See Foreign News).

▼ ▼ ▼

Just how touchy Venezuela has become over threat of Persian Gulf oil is shown in recent government and company reaction to a rumor.

The report was that Middle East crude was being run at Jersey Standard and Royal Dutch-Shell refineries on Aruba and Curacao. Normally, large volume of Venezuelan oil are run at both plants.

Both companies quickly and emphatically denied the report. Dr. R. Acosta, government's oil chief, announced an extensive investigation had proved rumor false.

Special commission is now investigating demands of Venezuelan labor for more benefits in new contract covering nation's oil industry.

Stakes are huge in the talks now going on. Companies estimate cost of benefits would total $1.2 billion and the union estimate is $120 million. Big spread led to probe by the Government.

▼ ▼ ▼

The Athabasca atomic blast has been temporarily delayed and not cancelled permanently, Cities Service of Canada says.

Richfield and Cities Service had planned to set off the nuclear test in February or March, hoping to recover oil from the famous tar sands.

Alberta government says, however, it does not see fit to allow the test in the immediate future. Reason: Canadian bigwigs feel the cold war may thaw and talk of banning nuclear tests will become reality.

Membership in OCAW union has declined 5,949 in a year, even though organizers signed up 21,935 new members.

Union officials did not give a cause for the drop in reporting to the OCAW convention in Cleveland. New organizing drives under a new director—Carl Mattern of Dallas—and industry-wide regional bargaining committees were considered by the convention.

Signs of the times: sums paid out in oil-industry strike benefits are heading toward an all-time record.

A serve-yourself gasoline pump is being tested by Humble at a Houston service station.

The coin-operated device may be useful in small towns, resort areas, and other spots where 24-hour service is not available.

▼ ▼ ▼

Ties between chemical and oil industries will grow closer in next 10 years, predicts J. Peter Grace, president of W. R. Grace & Co.

He says oil companies will continue to make new chemicals and market them. Also chemical companies will invade the oil business. He sees more of them in joint ventures in petrochemicals or even in oil exploration and production.

Fair trade apparently won't cure oil marketing problem: Too many stations competing for business.

In New Jersey, where fair trade returned in 1956, the number of independent stations has risen from 165 to nearly 600. Their volume has trebled and they are increasing their share of the market.

Gasoline stocks took a 5,039,000-bbl. drop last week, probably the sharpest downturn on record.

About 72% of the drop can be attributed to the East Coast and Illinois-Indiana-Kentucky areas.

Recent reduction in refinery runs won't explain the big drop because gasoline production for the same week was off only 1.7%.

Probable explanations: Heavy pre-October buying to get gasoline into secondary storage before the new 1-cent federal tax went into effect. Add to this a possible month-end correction in inventory statistics.

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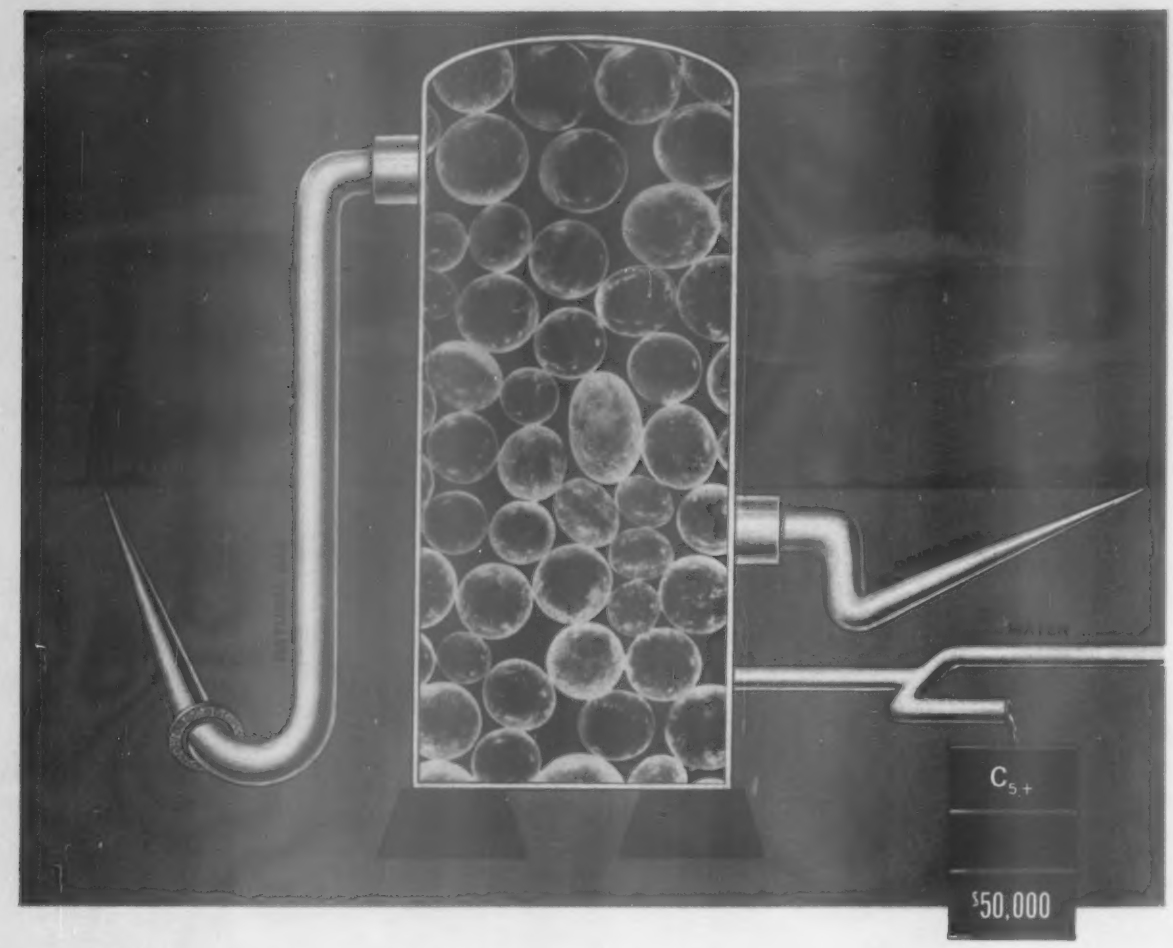

In Gas Transmission Service, Mobil Sorbead R recovers 24% more Liquid Hydrocarbons than Granular Silica Gel

Mobil Sorbead R is *the most efficient desiccant in use today* for recovering liquid hydrocarbons while dehumidifying natural gas.

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Mobil Sorbead R has a higher capacity for hydrocarbons than either granular silica gel or activated carbon. It has given up to 24% greater recovery of liquid hydrocarbons than granular silica gel, 43% greater recovery than activated carbon.

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Mobil Sorbead R has two more advantages over all other desiccants. Because of its mechanical strength and spheroidal shape, it is inherently the most resistant to dusting, and in service keeps pressure drop at the minimum.

Moreover, its adsorption capacity is not affected by unusually high inlet gas temperatures, and it does not require excessively high regeneration temperatures.

What is the typical pay-off for hydrocarbon recovery in a small plant? In a 20 MMSCFD unit, liquid hydrocarbon recovery of 30 to 50 barrels daily may be possible. With gasoline valued at $2.75 a barrel, this represents a revenue of $30,000 to $50,000 per year to users of **Mobil Sorbead R**.

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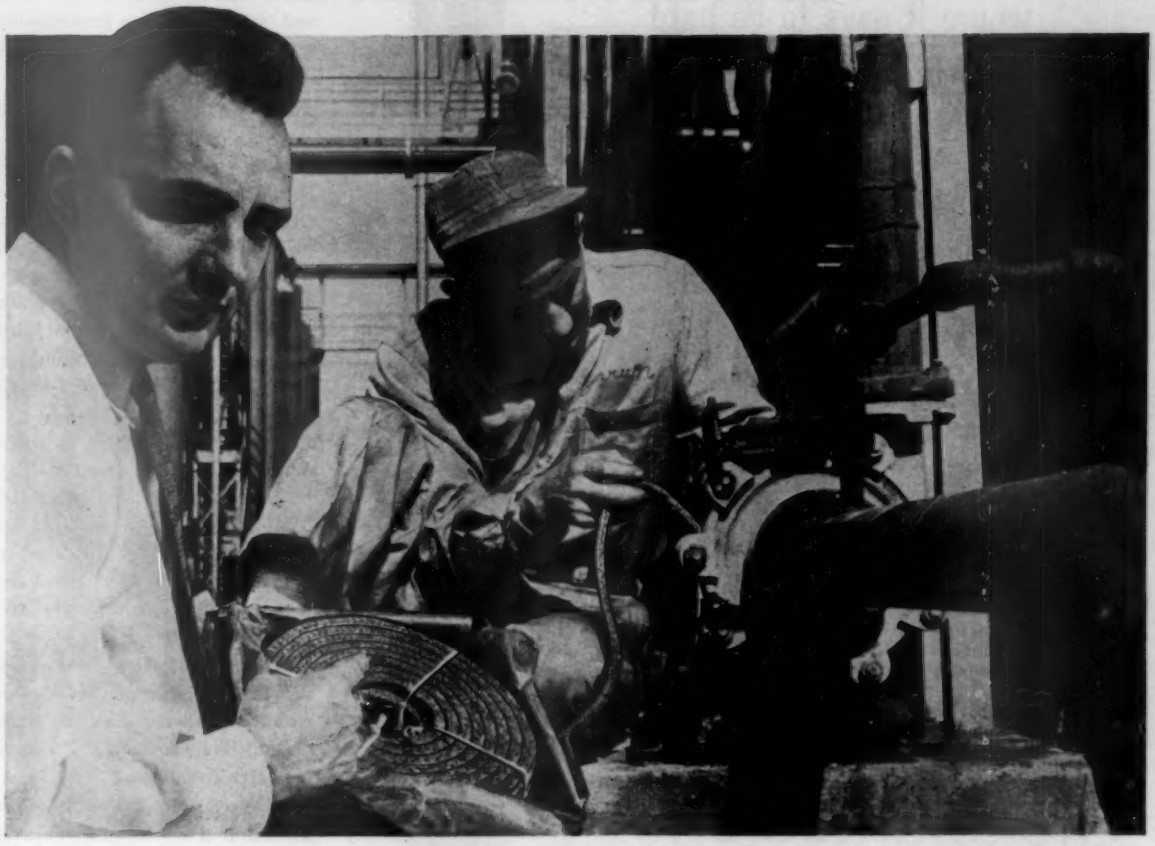

"We tested one packing after another... but only 'U.S.' could stand up,"

Says CHEMICAL PLANT SUPERINTENDENT

When a leading mid-western chemical company put their new plant into operation in 1955, they faced a problem with pump packings: To find a packing resistant to a combination of solvents, caustic and high temperature—with a minimum of shaft wear.

"We tested one packing after another on our caustic pumps," says the plant superintendent, "and found that U. S. Solvent Packing outlasted any other packing tested *by as much as 10 to 1.*"

Result: No more morale-breaking "clean-up" sessions, production is increased, personal injuries due to leaks have been reduced 75%, and there's no need for rescheduling due to breakdowns.

A "U. S." technician, of course, worked with engineers of the chemical company to develop the right packing for this particular requirement. That's part of the "U. S." service, when needed.

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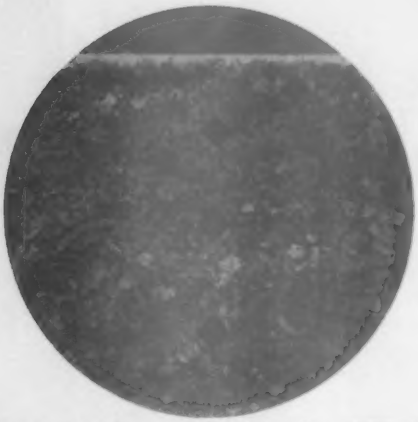
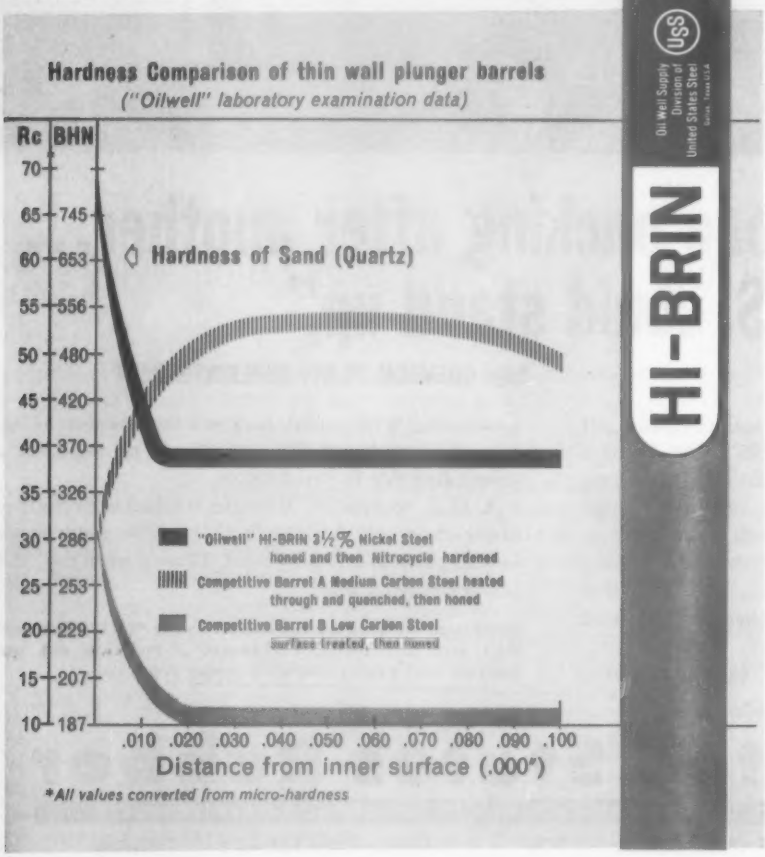
"Oilwell" Hi-Brin Subsurface Pump Barrels are hard where it pays to be hard ...at the wearing surface!



LOOK . . . at this photomicrograph! A cross section of "Oilwell's" HI-BRIN Pump Barrel, magnified 250 times, shows the hardness of the barrel interior and the white layer of superhard nitrides. The smallest black impression made by the hardness tester shows a Rockwell "C" hardness of 68.



Examine this hardness comparison chart for a moment . . . and you'll see the performance secret of "Oilwell" Hi-Brin Subsurface Pump Barrels.

The secret is *controlled* hardness!

Compared with competitive barrels, the inside surface of Hi-Brin Barrels is harder to begin with . . . and STAYS harder right through the point (about .006" on the radius) where fluid slippage, due to wear, makes pump replacement necessary. Extreme hardness drops beyond this point . . . keeping intact the inherent toughness of the alloy steel tube.

Through "Oilwell's" exclusive distortion-free process, Hi-Brin Barrels are finish honed BEFORE hardening, so that the layer of superhard nitrides remains on each barrel's inner surface to greatly retard the rate of wear.

Hi-Brin Barrels are extremely resistant to hydrogen sulfide corrosion and to the abrasive action of sand. They contain 3½% nickel for extra toughness.

Contact your "Oilwell" representative or visit your "Oilwell" store for more information about Hi-Brin Pump Barrels. Try one in your next well. Your first Hi-Brin Barrel will certainly lead to more.

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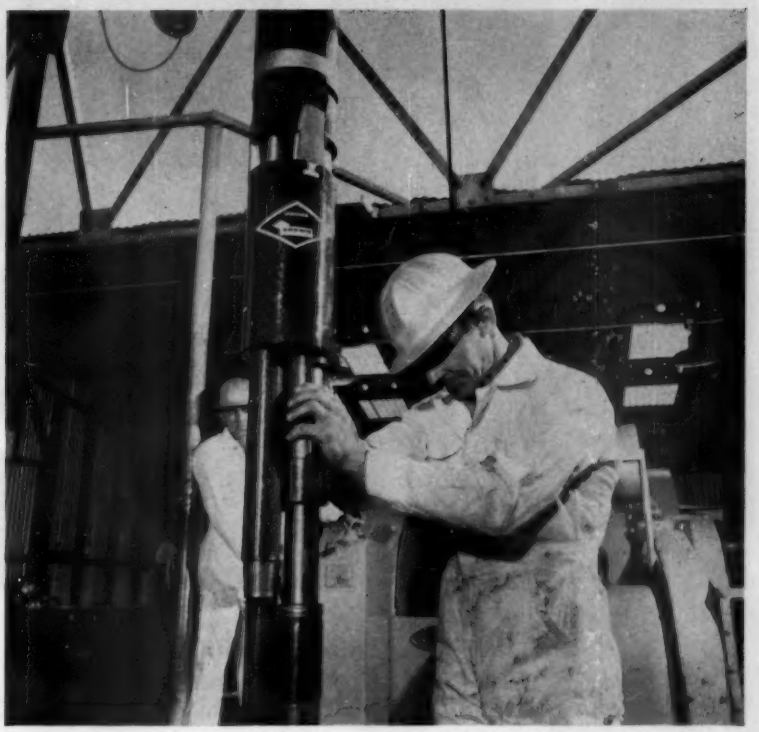

NEW TUBING PACKER USES HYCAR

to permit multiple zone completion

Type HS-8 hydraulic-set, retrievable multi-zone tubing packers are made by Brown Oil Tools, Inc., Houston, Texas. Hycar seals are molded by Murray Rubber Company and Houston Rubber Company, both of Houston. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

A new multiple zone tubing packer incorporating Hycar nitrile rubber has already proved itself in many multiple zone completions. As many as four pay zones in a single well have been tapped with the unit.

Requirements were tough. Very little space is available, especially when as many as four tubing strings run through a single seal. Many materials were tested — even soft metal. However, engineers who selected Hycar made this statement: "Hycar 1072 provides a completely dependable seal, standing up under elevated pressures better than any other rubber."

In addition, Hycar withstands constant exposure to well fluids such as sweet and sour crude, distillate, methane gas, salt water and drilling chemicals — fluids that would kill ordinary rubber. You can get more information about how Hycar solves tough oil field operating problems by writing Dept. CE-5, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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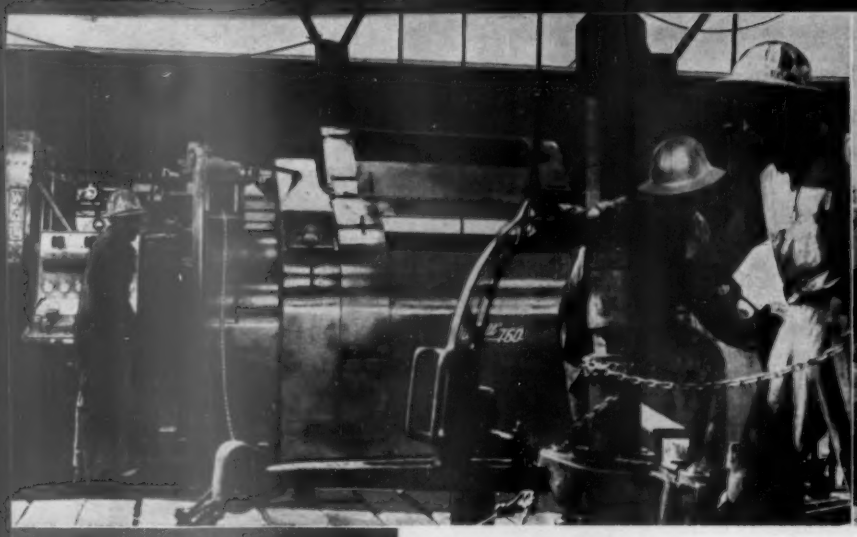

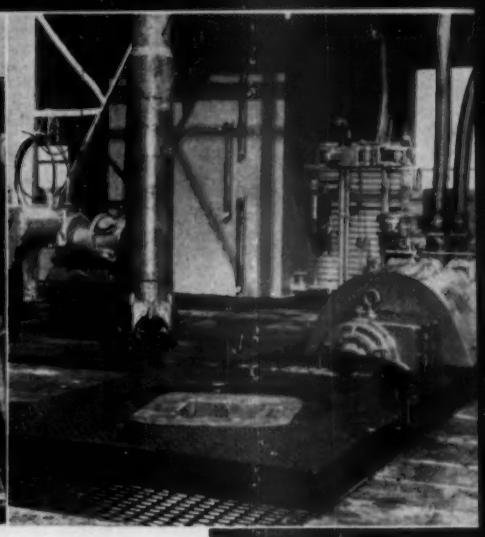

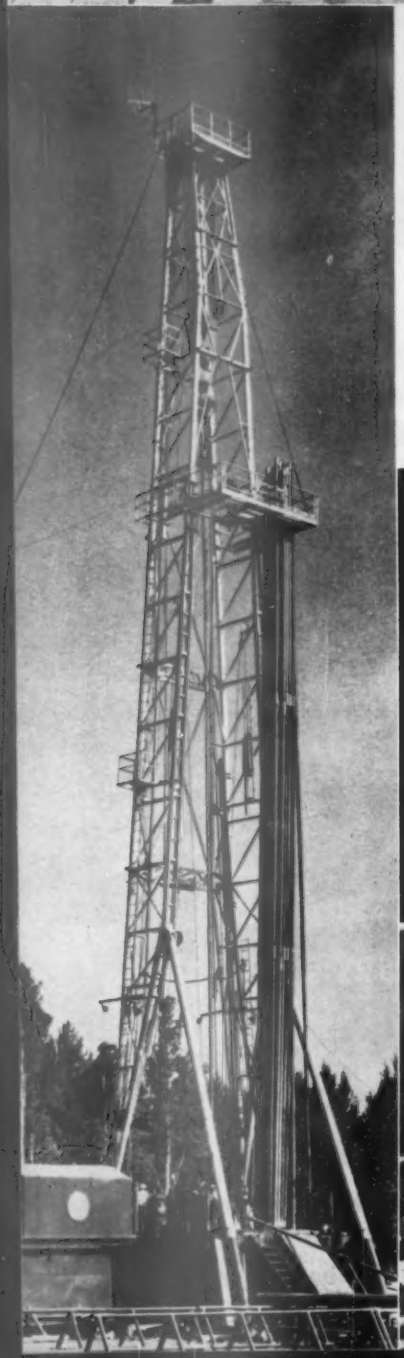

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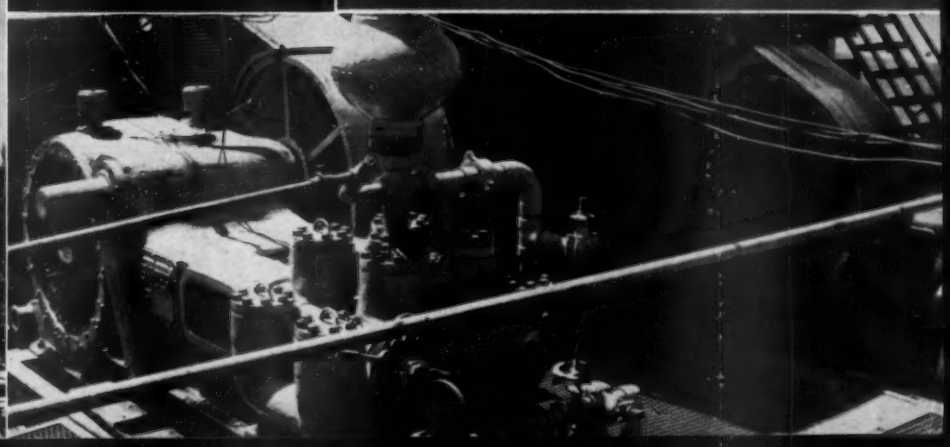

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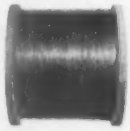


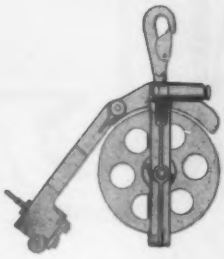
REGULAR LINE

GALVANIZED LINE

• **Regular, Bright and Improved Steel** — for economical use in wells under normal condition.

• Stainless Steel — designed for longer life when attacked by sour crude oil or gas.

• Galvanized Steel, Zinc Impregnated — will not rust, check or peel under normal operating conditions.

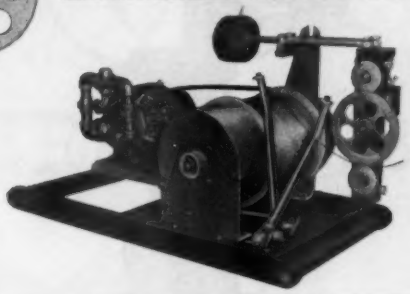


LATCH TYPE HAY PULLEY WITH LINE WIPER

This standard assembly is recommended for paraffin cleaning and may be used to run line in open hole, drill pipe, tubing or casing. The Halliburton Measuring Line Wiper keeps line clean and assures greater accuracy and longer life.

STUFFING BOX AND STAFF ASSEMBLY

Recommended for measuring in open hole or casing while well is shut in under pressure up to 15,000 psi. The wearing surface of measuring line sheave is made of durable, long-wearing material and is precision designed.

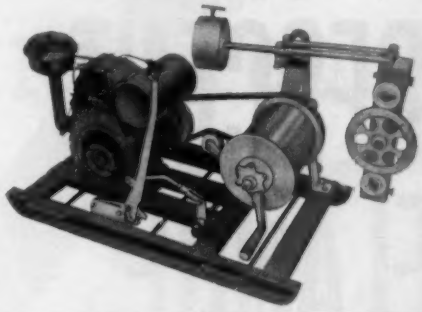


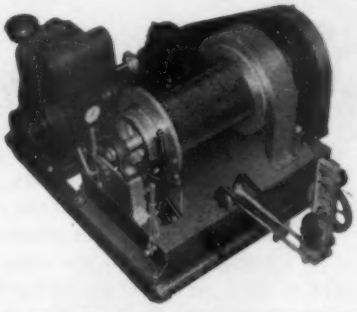
AIR-POWERED MEASURING ASSEMBLY

Driven by compressed air power for greater safety and flexibility. Suited for well measurements requiring high starting torque, accurately controlled variable speed, or where possible safety hazards exist. Powered by radial 5-cylinder air motor, with built-in gear reduction.

REGULAR DUTY TYPE POWER-DRIVEN

Designed for fast, efficient service on light measuring operations. Driven by single cylinder, air-cooled, 4.3 H.P. Briggs and Stratton gasoline engine with gear reduction power take-off. Reel is equipped with V-Belt Drive, V-Belt Idler Pulley Clutch Assembly and will carry 8000′ of .092″ dia. measuring line.





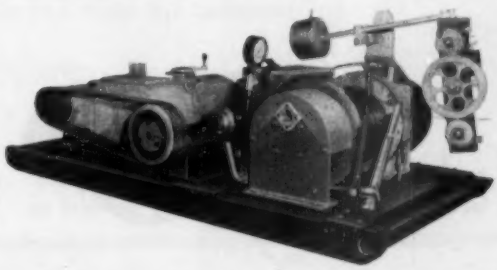
SUPER DUTY TYPE POWER-DRIVEN

Designed for measuring work requiring large amounts of Measuring Line or small amounts of cable used in wire line services. Powered by a Wisconsin AEN 8.25 H.P. engine with a 6.1 clutch reduction. Super Duty Reel is capable of performing severe oil field wire line and conductor work and will carry 3000′ of $\frac{5}{16}$″ dia. cable.

EXTRA-HEAVY DUTY POWER-DRIVEN

(Three Speed Transmission)

Designed for accurate and efficient measuring in the deepest wells under the most rugged conditions. Used where dependable electric AC power is available. Measuring Assembly is powered by a 5 H.P., 220-440 volt, 3 phase, 60 cycle uni-closed variable speed electric motor. (Explosion proof motor is available at additional cost.) The unit features a mechanical transmission, with three speeds forward and one speed in reverse, for operations where unusually low line speeds or maximum line pull are required. This Extra Heavy Duty Reel Assembly will carry 14,000′ of .092″ dia. measuring line.



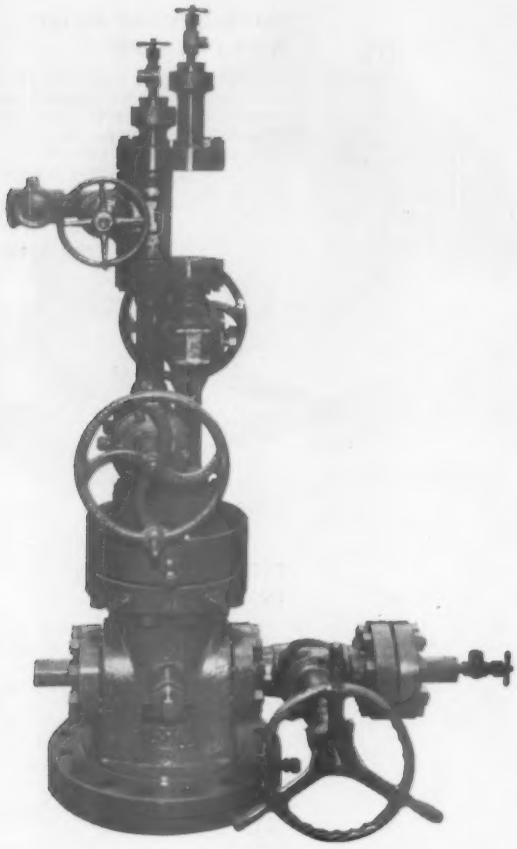
284 SERVICE CENTERS...TO SERVE YOU BETTER

HALLIBURTON MEASURING EQUIPMENT

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

NOW

A CRESCENT FLANGE TREE



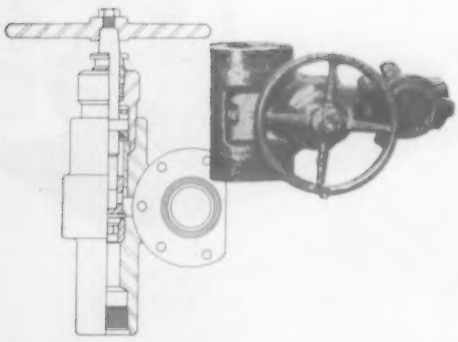
with the time-proven J-E flow control

The O-C-T Crescent Flange Tree offers unmatched flexibility, simplicity and economy in that one valve in the dual hookup can be removed without disturbing the other.

Now, O-C-T offers the CRESCENT FLOW CONTROL. It features all advantages of the **time-proven J-E Flow Control** AND has individual crescent flanges for dual trees.

Thus, the Crescent Flange Tree has new compactness and economy. Further elimination of connections guarantees leak-proof operation.

If there is a dual in your future, you will profit by talking to an O-C-T representative.



where progress is a daily practice

O·C·T

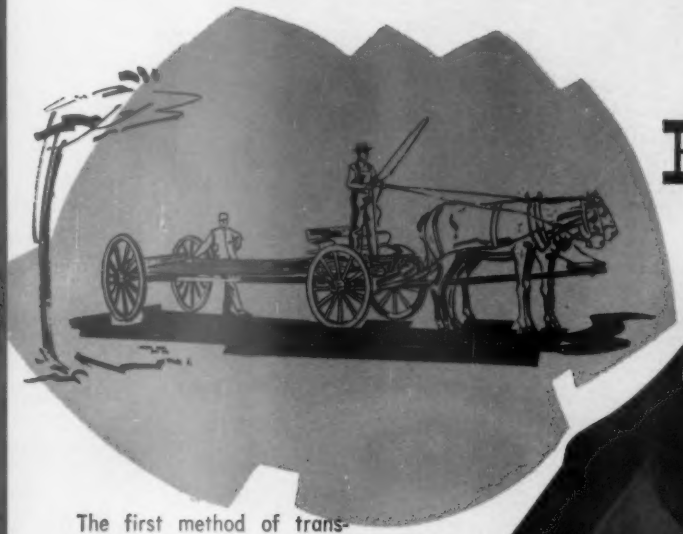
OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to
P. O. Box 3091, Houston, Texas.

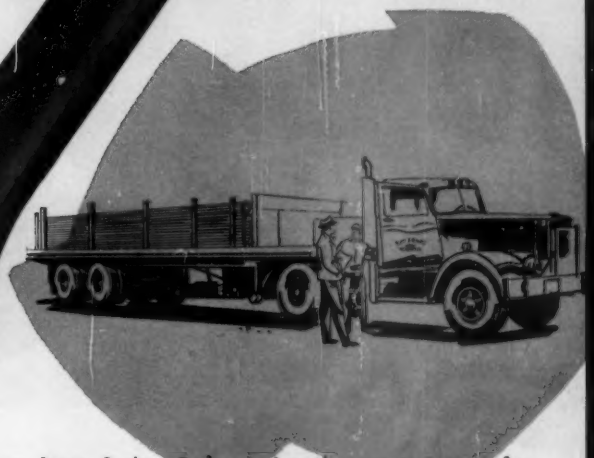
JONES

FIRST IN 1894...



The first method of transporting Jones all-metal sucker rods left something to be desired. Not much support for those rods between the wagon axles...

FIRST TODAY...



Now, Jones Sucker Rods receive the greatest care in handling and shipping...rail or truck...so that they arrive with factory perfection. Another service you can expect from **Sucker Rod Specialists!**

...because we're Sucker Rod Specialists!

There are four JONES JOB-ENGINEERED SUCKER RODS... a type for every pumping need!

THE S. M. JONES COMPANY

Division of Buffalo Eclipse Corporation

General Office and Factory: TOLEDO, OHIO

Sales Office: Enterprise Building, TULSA, OKLAHOMA

Export Sales Representatives:

IDECO, One of the Dresser Industries, Dallas—New York

Franklin Supply Company, Export Division, Inc., New York

TEX-TUBE Teamwork delivers the

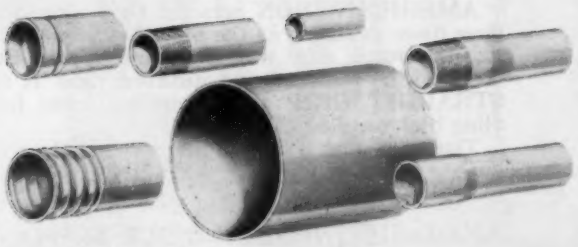
Tex-Tube's reputation for *having the goods* and *meeting its schedules* is not accidental. It is the result of close teamwork between sales-service, warehousing and mill facilities.

The sales department provides continuous and detailed feedback from the field which enables Tex-Tube to forecast pipe needs in the months ahead. This information is used in determining mill schedules and maintaining well balanced stockpiles of line pipe, oil well casing and tubing, and structural and mechanical tubing. At Houston and six other locations in the South and Southwest, every type and size of tubular goods are available—often for immediate shipment to your job.

Tex-Tube's ability to keep *ahead of the market* means dependable, on-time service for you.

Photo left shows Tex-Tube semi-trailer loaded with 282 joints of 3½" OD grooved tubing. This quick-coupled pipe is made by Tex-Tube for use with Victaulic Company of America couplings.

goods on schedule



TEX-TUBE, INC.

1503 NORTH POST OAK ROAD • HOUSTON, TEXAS

Sales Offices in Midland, Texas—Tulsa, Oklahoma—Dallas, Texas—Los Angeles, California

No joint leakage...no creep with AMERICAN IRON Straight Grip Tool Joints!

No worry about joint leakage or creep with our 4 POINT SEAL PROTECTION . . . in fact, the seal actually becomes TIGHTER as the tension load and pump pressure are increased.

AMERICAN IRON Straight Grip tool joints are *three times* as strong as the pipe they connect! You'll like the quick, easy way this hand applied Straight Grip can be removed and installed right at the rig. STRAIGHT GRIP tool joints are ideal for handling high tensile drill pipe.

These are just a few of the reasons why you buy quality when you specify AMERICAN IRON.

AVAILABLE THROUGH YOUR SUPPLY STORE

AMERICAN IRON
Straight Grip
TOOL JOINT

AMERICAN IRON

Another AMF Product
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AMERICAN IRON & MACHINE WORKS CO., INC. · OKLAHOMA CITY ·

IT'S DOLLARS per BARREL THAT COUNT!

TRIM THOSE PRODUCTION COSTS WITH

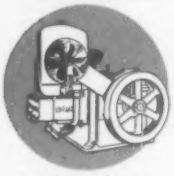
LUFKIN

Field tests have shown that the plunger action resulting from LUFKIN'S UNIVERSAL CENTER LINE DESIGN produces MORE OIL with LESS POWER consumption.

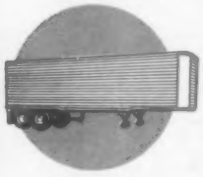
OVERSIZE BEARINGS and HEAVY RUGGED CONSTRUCTION throughout minimize maintenance costs.

OPTIONAL FACTORY LUBRICATED BEARINGS eliminate the expense of periodic field lubrication.

PUMPING UNITS



GAS ENGINES



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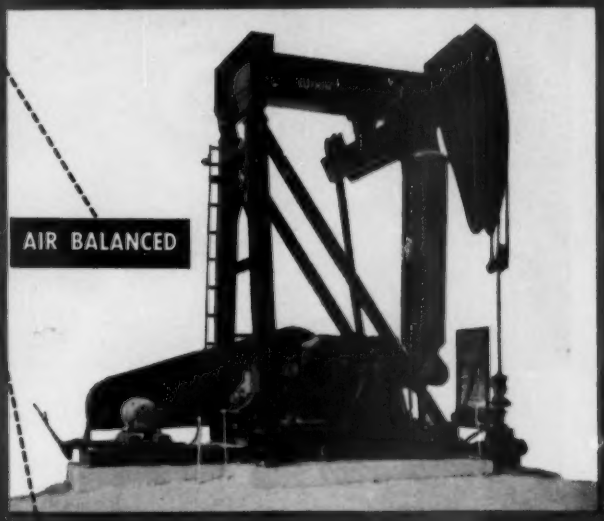
SPEED INCREASERS AND REDUCERS

A factory trained LUFKIN SERVICE MAN is always available on short notice, and parts can usually be obtained overnight — thus avoiding production loss due to long shut down periods.

You Can Relax When Your Lease Is **LUFKIN EQUIPPED**



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Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada

MR. JOE ZEPPA

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Delta Drilling Company

President,
American Association of
Oilwell Drilling Contractors

"Initiative, ingenuity and inventive skill."

"Modern drilling programs continue to become more demanding. Deeper wells, higher pressures and temperatures require the Drilling Contractor to have the finest equipment, top-notch crews and, above all, the know-how to drill a good well economically.

"Progress in oil and gas well drilling would have been much slower without a healthy, competitive contracting industry.

"The Drilling Contractors' feverish search for improvement, coupled with today's technological and equipment advances, make it possible to get the job done faster, under more difficult conditions, with a greater amount of success and at a lower cost per foot.

"Much of the credit for this can be given the equipment and service industries whose continual research and development programs have offered solutions to many of the complex drilling and production problems.

"As a Drilling Contractor, in a highly competitive business, I can attest to the many advances made in our industry. This progress is the result of initiative, ingenuity and inventive skill so typical of the manufacturing, supply and service companies serving us today."

P.E.S.A.

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

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PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

throughout the World

DRILLERS ON THE MOVE

SPECIFY CONTINENTAL-EMSCO

open here for drilling equipment

UNEXCELLED PORTABI

. . makes the largest C-E A Series Rig

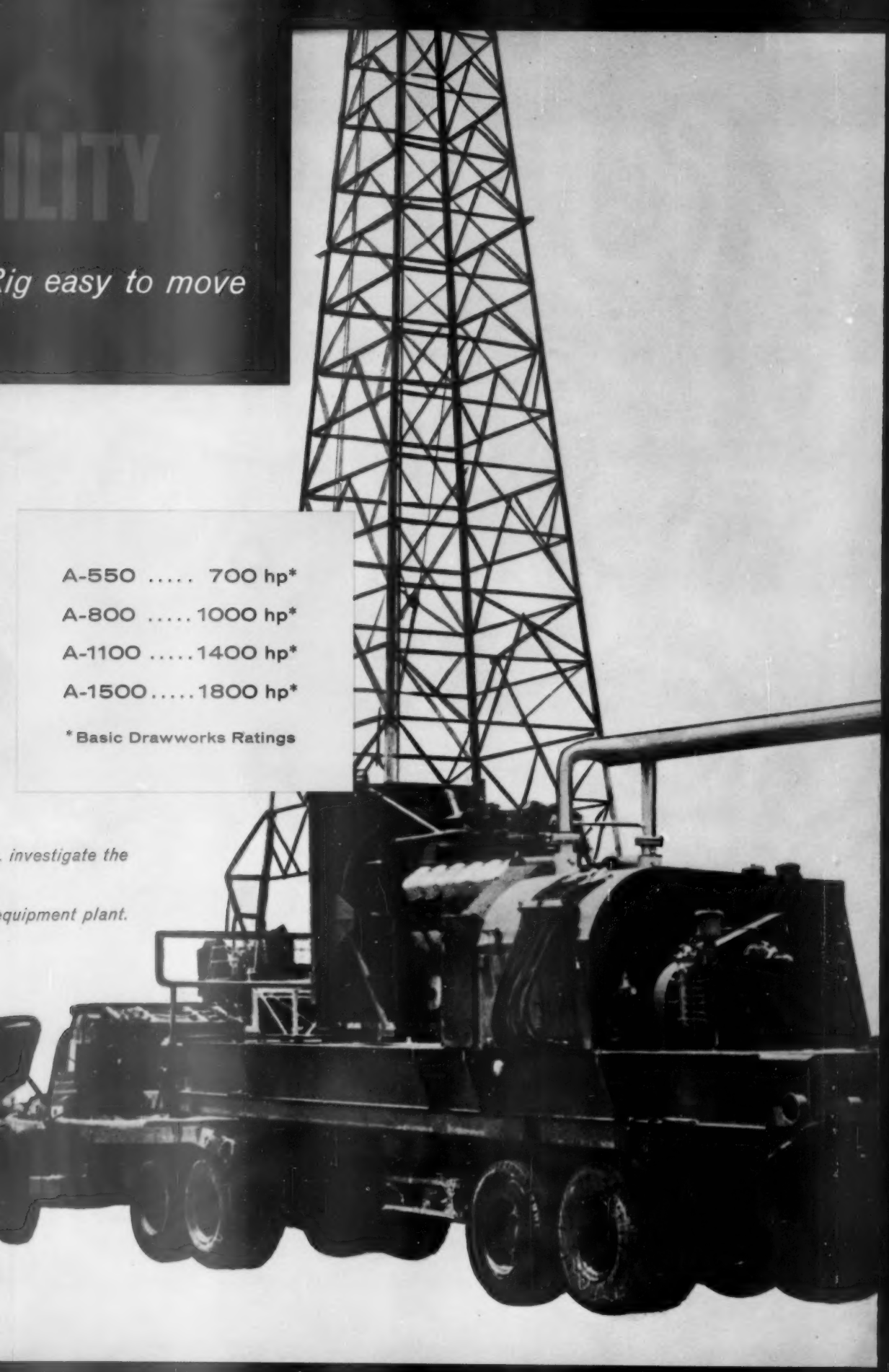
Drillers on the move the world over have found that Continental-Emsco's A Series rigs are designed for fast, low cost moves . . an important point in today's highly competitive market. Each rig in the A Series is designed to break down into easily transportable packages of ideal weight and dimensions. Assembly and disassembly is fast and sure.

Versatility is designed into these rigs. Separate drawworks and sectional power ends offer maximum flexibility in meeting various horsepower requirements, types of substructure and the number and location of mud pump drives.

When you want power, yet compactness . . portability, yet
ruggedness . . economy, yet versatility . . in
competitive advantages of the high quality Series A rigs . .
manufactured in the world's most complete oil field equ

ILITY

Rig easy to move



A-550	700 hp*
A-800	1000 hp*
A-1100	1400 hp*
A-1500	1800 hp*

* Basic Drawworks Ratings

. investigate the

equipment plant.

Drillers on the move..

depend upon

NEW BEDFORD

"NONE BETTER"

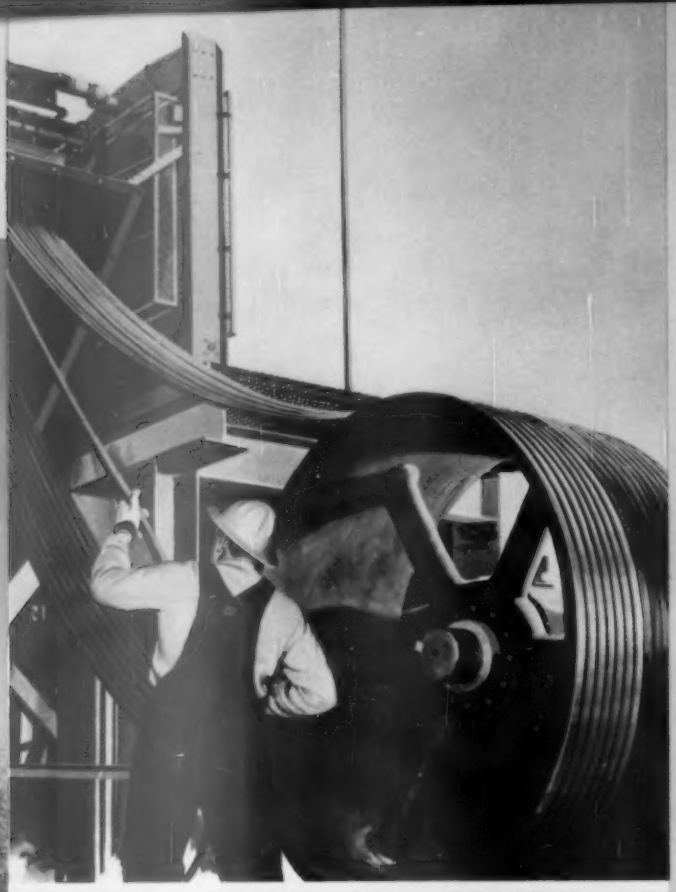
PURE MANILA

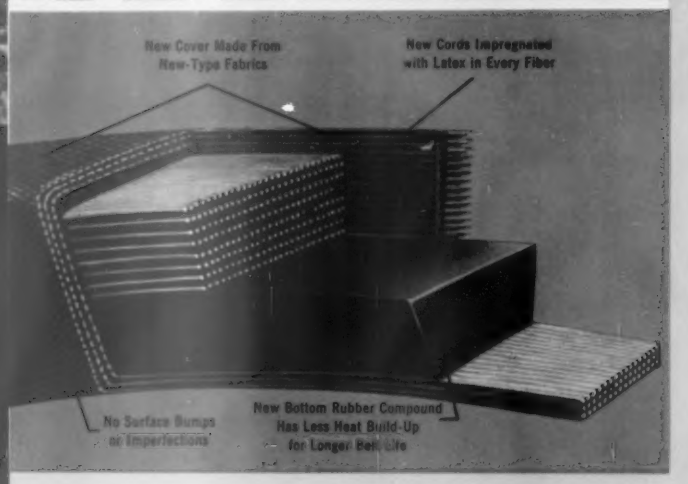
..the drilling man's rope

The proven dependability and economy of Manila rope is enhanced by New Bedford's knowledge of rope manufacture. Their special treatment reduces the damaging effect of rot and mildew for longer life even in swampy, humid areas. New Bedford rope resists water and oil absorption, making it ideal for *any* job around a drilling rig . . on land or sea. Scientific lubrication reduces internal friction for maximum rope life and maximum safety at all times.

Here's a rope that costs no more, yet means so much more in safety, ease of handling, longer life. Be a user of New Bedford Manila rope . . the finest in the oil fields . . through Continental-Emsco, worldwide.

NEW! *C-E Green Triangle Spinning Lines . . . the green strand is the exclusive mark of quality unequalled in the oil industry.*




New Cover Made From New-Type Fabrics
New Cords Impregnated with Latex in Every Fiber
No Surface Bumps or Imperfections
New Bottom Rubber Compound Has Less Heat Build-Up for Longer Belt Life

RIG UP *with* GREEN TRIANGLE SUPER V-BELTS

40% *more capacity*

ALL NEW CONSTRUCTION provides built-in reserve strength and a vibration free balance for handling 40% more horsepower . . with *no* increase in price.

ALL NEW CORDS, impregnated with latex in *every* fiber to assure maximum shock resistance and to guarantee that each cord pulls its share of the load.

ALL NEW MOLDING METHOD eliminates all inner and outer imperfections and harsh surface bumps for *even* longer belt life. Stretch has been reduced for less field adjustments.

ALL NEW COVERS, made by a new molding technique which blends new-type fabrics into a homogeneous unit, greatly extend running life of belts . . provide better flexibility over small sheaves.

C-E Green Triangle Super V-Belts are available exclusively from Continental-Emsco in matched sets to assure uniform high quality, grade, size, diameter and freshness.

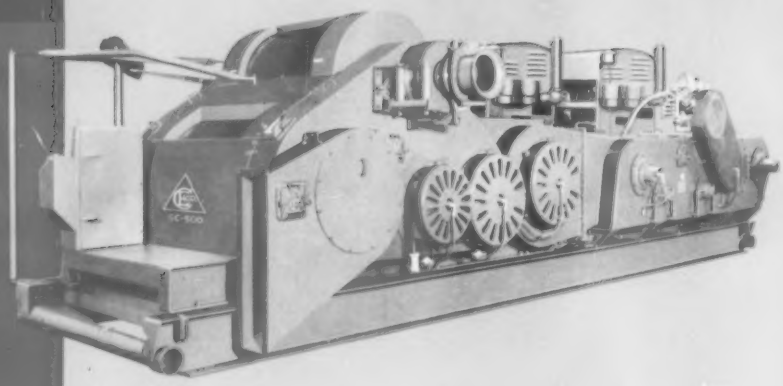
COMPLETE

Engine-Drawworks

PACKAGED UNITS

Continental-Emsco

G Series Drilling Rigs



GB 160 and GB 250 - one or two engine, torque converter units for split rig arrangement. 200 and 300 hp.

GC 350 - one, two or three engine, torque converter unit, may be used as a split rig arrangement or as a combined unit with mud pump drive from the compot. 1 450 hp.

GC 500 - two or three engine unit with optional engine drives of Airflex clutches, torque converters or fluid couplings. 600 hp.

Profitable drilling in the shallow to medium depth range is assured with C-E's compact, tough G Series, single-package drilling rigs. These rigs are made in the world's most complete oil field equipment plant. This *extra high quality* gives you the added performance needed for getting and completing jobs . . with more profits. Portability, performance and flexibility are designed into all of these units. Big rig features include air-operated selective transmissions, driller's control console, enclosed water cooled brake rims (water spray on the GB-160) and oil pressure lubrication. Check the complete G Series line for the rig that meets your requirements best . . used around the world by *drillers on the move.*

C-E TRAVELING BLOCKS

Lever-type oil gravity eliminates sanding, assures a straight travel. Bail tubing block. Forged steel rims are flame hardened to increase wire line life. Reversible lubrication cartridge makes it possible to lubricate from either side as desired.

CONTINENTAL-EMSCO

TRAVELING BLOCKS

HOOK BLOCKS

SWIVELS

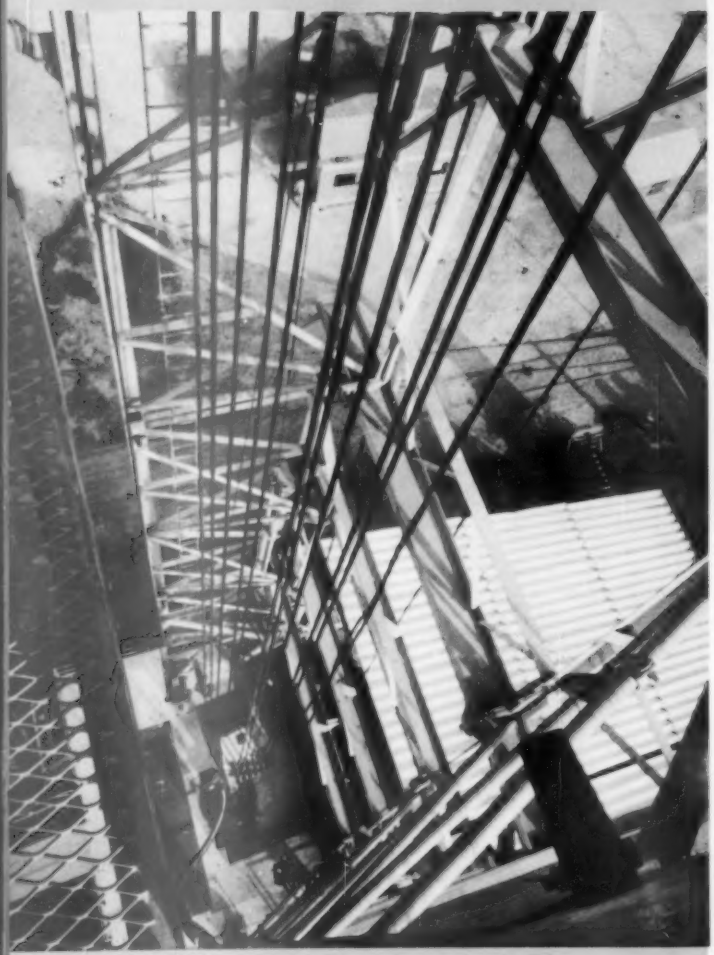
. . each designed to do tough drilling jobs better . . longer

C-E HOOK BLOCKS

Combines the advantages of C-E RA series traveling blocks with Wilson Hydra Hooks. Small in size, ample weight, slim-line design.

C-E SWIVELS

One-piece cartridge-type washpipe packing withstands highest mud pressures and is easily replaced . . platform mounted gooseneck can be removed for washpipe and packing replacement without disturbing rotary hose.



"POWERSTEEL"

. . always available from **STOCK** *throughout the world . . exclusively at C-E stores or through C-E representatives*

You get a keen sense of satisfaction rigging-up with POWERSTEEL. A satisfaction that you are using the best . . an extra high strength wire rope more than equal to the greater horsepower of modern rigs. A satisfaction of using a line designed . . *through metallurgical research* . . to provide fatigue-resisting qualities to withstand the continual shock and wear of faster drum speeds. There's a satisfaction, too, of knowing that your drilling contracts will be completed quicker with less chance of *wire line failure downtime* and that this stronger wire line results in more ton miles per dollar. Let us explain Broderick and Bascom's *tailored cutoff plan.* It's the *modern* way to bring wire line costs down to the bare minimum.

In Both Hemispheres,

CONTINENTAL-EMSCO *supplies*

DRILLERS ON THE MOVE!

Matching C-E's high quality drilling equipment is a worldwide, highly efficient service network of over 100 stores, offices and factories. In overseas drilling areas, an additional number of C-E representatives are *on the move* providing routine supplies, as well as those critical parts that make it possible to bid, get and *profitably complete* highly competitive jobs with C-E equipment.

For Service that Sings.. Equipment that Hums.. Go..

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas
Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada
Continental-Emsco Company C. A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts., England • *Representatives in All Principal Oil Fields of the World*

ANOTHER WAY RCA SERVES BUSINESS THROUGH ELECTRONICS

New RCA Transistorized "Low Drain" Mobile Unit Greatest Value...in Performance...Service...Price

Looked at from any angle—performance, service, price—the new "LD" (Low battery Drain) 2-Way Radio is sensational news from the leader. Minimum tubes in the receiver, no vibrators in the power supply—they've been replaced by readily available stock transistors for long life and dependability! Transistors used only in circuits where long experience has proven they can give reliable performance. Your RCA representative will be glad to show you why the "LD"—dollar for dollar, feature for feature—is today's greatest 2-way radio value.

Heat drain reduces internal temperature of unit up to 40%, providing longer component life (case has wrap-around heat sink). Standby monitoring feature cuts battery drain to a mere 2¼ amps. With vehicle engine off, radio can be left on to receive incoming messages for long periods without impairing battery life—automotive cabling used exclusively for greater flexibility, positive contact, corrosion resistance. Five watts of audio power for greatest message intelligibility. Equipment easily moved from car-to-car—trunk or true-dash mount. Security sealed circuits clearly numbered to provide "road map" for fast, simple servicing—RCA Service Company technicians available to keep your equipment operating at maximum efficiency.

Mail coupon for further facts.

RCA's FIRST NAME IS RADIO

RCA Tmk(s)®

RADIO CORPORATION of AMERICA

COMMUNICATIONS DIVISION • CAMDEN, N. J.

RADIO CORPORATION OF AMERICA
Communications Division, Dept. Z-89, Building 15-1, Camden, N. J.

☐ Please send me FREE literature on the new RCA Transistorized Mobile Radio

☐ Have RCA Communications Specialist contact me and explain why this is today's best value in 2-way radio

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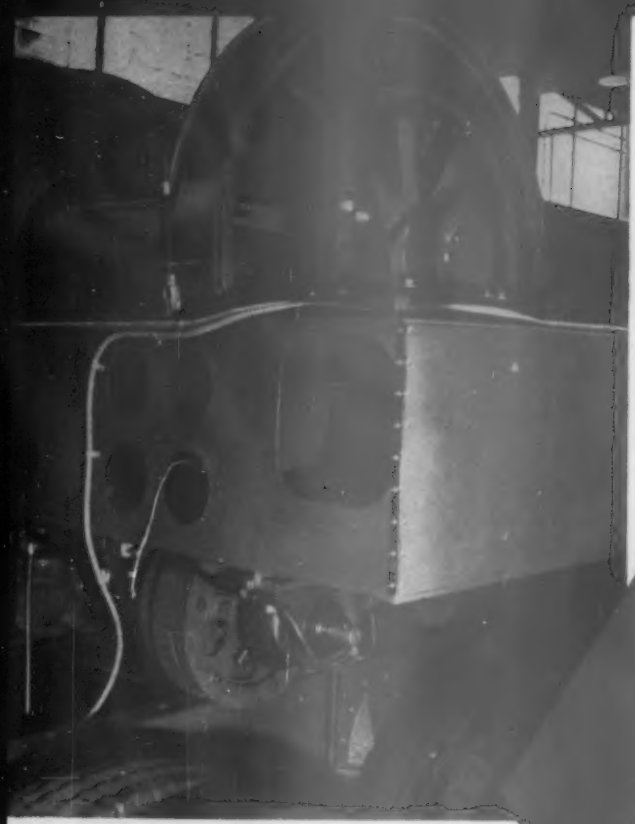

"For our needs a Wichita Clutch means

RELIABILITY!"

say the engineers
of
SCHLUMBERGER
Well Surveying Corp.

"Reliability of clutch operation is the greatest benefit to our application. WHY? Because breakdowns during operations in an oil well could cause loss of our instruments and thousands of dollars in drilling rig operating expenses. We have therefore chosen Wichita Clutches for the Winch drive of our units. They have performed well throughout tests and field operations."

When You Need a Clutch . . . or Brake Make Sure it's a Wichita . . . You'll Find it Pays . . .

Wichita Standard Air-Tube Disc Clutch

Contact your nearest Wichita Engineer!

Clutch & Control Engineering Co., Livonia, Mich.
L. H. Fremont, Cincinnati, Ohio
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Smith-Keser & Co., Avon, Conn., Philadelphia 44, Pa., and New York, N. Y.
Frank W. Yerline Co., Chicago, Illinois
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WICHITA CLUTCH COMPANY, INC.

LIGHTWALL . . . biggest value for your pipeline dollar

Southwestern LIGHTWALL Electric Resistance-Weld Line Pipe greatly reduces weight without sacrificing performance . . . delivers actual dollar savings four ways over standard-weight pipe. With Southwestern LIGHTWALL, every customer benefits from savings in initial cost, transportation, installation, and in longer life when given proper corrosion protection. Southwestern LIGHTWALL Electric Resistance-Weld Line Pipe is available in a wide range of wall thicknesses to .188" wall, from 1.315" O.D. to 4.500" O.D. Because of Southwestern's manufacturing flexibility and large inventories of selected steel coils, you can depend on prompt deliveries.

LICENSED BY THE AMERICAN PETROLEUM INSTITUTE

SOUTHWESTERN PIPE, INC.*

Corporate name changed from Southern Sales & Transportation Co, May 1st, 1959

P. O. BOX 2002 HOUSTON 1, TEXAS PHONE CAPITOL 4-0631

THREDKOTE 701

keeps your tool joints on the job

For longer tool joint service, protect the threads from first trip to last with Humble's Thredkote 701.

Give new tool joints a specially careful and generous coat for good lubrication and maximum protection. Continued use of Thredkote 701 on each trip will keep your string running tight and true.

Joints make up tight and break out easy. As the string is run, the 60% pure metallic zinc in Thredkote 701 effectively guards against metal-to-metal contact and prevents galling. And Thredkote 701 maintains its quality and consistency under the most rugged running conditions.

Thredkote 701 is available in 25 lb. pails and in 200 lb. and 600 lb. drums. Call your nearest Humble wholesale plant in Texas and New Mexico. Thredkote is also available through many oil field supply stores. The price is right, and delivery is quick.

HUMBLE OIL & REFINING COMPANY

Other Humble Thread Compounds

- **THREDKOTE 700** — lower cost, red lead base lubricant for casing, tubing and tool joints.
- **THREDKOTE 703** — 85% metallic zinc, for use where pressures exceed 2000 lbs. per square inch.
- **THREDKOTE 705** — lubricates, fills and seals worn, wobbly tool joints.
- **THREDKOTE 706** — meets all requirements for A.P.I. high pressure thread lubricants suitable for pressures exceeding 10,000 lbs. psi.
- **THREDKOTE 708** — forms an insoluble seal at threaded connections servicing gas, gasoline, solvents and kerosene.
- **THREDLOK 801** — a new product for sealing and locking casing joints.

HUMBLE

DEHYDRATES

DAVISON SILICA GEL GIVES GREATEST PROTECTION

One cubic inch of Davison Silica Gel has an adsorptive surface of 90,000 square feet—an area larger than two city blocks! This capacity has made Davison Silica Gel the favored desiccant for air and gas dehydration and wherever rust, corrosion, or other moisture problems exist. For instance, Davison desiccants are used to protect tropical shipments, to clean and dehydrate air and natural gas—refrigeration systems—blast furnace gases—and in oxygen plants. Perhaps the application of a Davison desiccant to *your* moisture problems is in order. Write Department 3128 or call today for complete information.

W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND

Tuboscope® COMPANY

MAXIMUM DRILL PIPE-CASING PROTECTION

TUBE-TECTOR® protectors withstand the high temperatures, abrasion and hydrocarbon compounds encountered in modern day drilling.

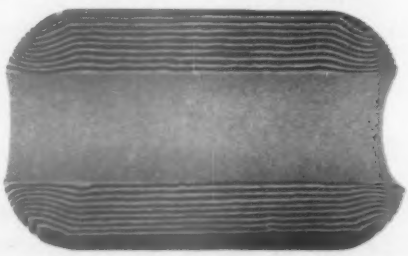
Manufactured from a continuous strip of special oil-resistant rubber material, TUBE-TECTOR protectors provide the rugged "stay-put" protection demanded by today's oil industry.

TUBE-TECTOR protectors last longer and provide the economy of extended re-use. The cost is no more than that of ordinary protectors.

Get the protector engineered for today's drilling. Call Tuboscope.

TUBE-TECTOR®

DRILL PIPE PROTECTORS



The straight bore design, laminated construction and flow-contoured shoulders provide a tight grip from end to end to resist movement and ring corrosion.

TUBOSCOPE®

2919 Holmes Road
Houston, Texas

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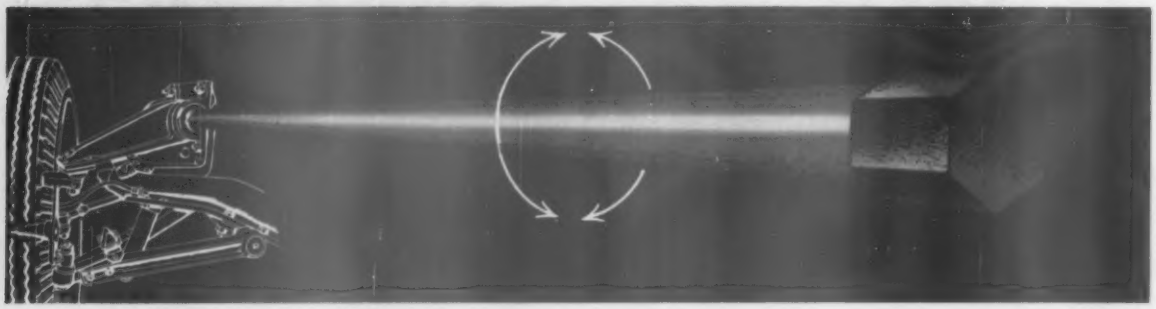
NEW AND USED DRILL PIPE, CASING, TUBING AND SUCKER ROD INSPECTION

ANNOUNCING
Chevrolet trucks for 1960 with total newness!

Here comes the biggest improvement in trucking in decades . . . a revolutionary improvement that can make any truck route in America a far smoother road to bigger profits for you. Turn the page for the hottest news for truckers since coffee was invented!

new torsion-spring ride!

THE SMOOTHEST THING THAT EVER CAME BETWEEN A ROAD AND A LOAD!



Independent front suspension with tough torsion bar springs . . . for trucks! Years in the making, this totally new suspension system protects everything from bumps and jolts . . . provides a new kind of performance that lengthens truck life, protects cargoes, reduces driver fatigue and cuts maintenance expense to new lows. Independently suspended, each front wheel steps cleanly over bumps. And the friction-free torsion bars work to absorb each jolt or jar; they flex freely, even on the smallest bumps, yet have the capacity to absorb severe shocks. The result is a truck ride so wonderfully smooth that it must be experienced to be believed! And it's now *standard* in *all* classes of 1960 Chevrolet trucks!

Three tailored-to-the-truck rear suspensions complement the revolutionary torsion bar independent front suspension. *In Series 10 and 20 models,* frictionless high-capacity coil springs ease the rear axle over bumps. *In Series 30* and 40 models,* a new two-stage leaf spring provides tailored springing action . . . *and in Series 50, 60, 70 and 80 models,* all-new variable-rate rear suspension gives spring resistance that adjusts automatically to cushion any size load.

**Optional at extra cost.*

Chevrolet trucks for '60

new style, new models!

NEWLY ENGINEERED FOR EXTRA SAVINGS THROUGH EXTRA STRENGTH!

Rolling in on revolutionary torsion springs, these 1960 Chevies are smooth as silk yet tough as nails . . . totally new in scores of profit-boosting ways! In the light-duty class, for example, big new Series 40 chassis-cabs and stakes add to your earning power with G.V.W's up to 14,000 lbs. And virtually every model offers a new lower-to-the-ground build (without sacrificing road clearance) which improves truck stability and makes cab entry easier. In the big-truck class, too, Chevy for '60 sports big-profit G.V.W.'s — up to 19,500 lbs. in middleweights and 36,000 lbs. in heavyweights — with stronger components including new frames with more massive bracing and brawnier side rails, new bigger brakes, and the latest in low-cost V8 or 6-cylinder power.

New Comfort-King Cabs! There's more comfort than ever before, with 5 inches more shoulder room, 6 inches more hip room and more leg room and head room, too! A new wider seat, combining S-wire, coil and flat spring elements, offers a new high in easy riding. And Chevy's new double-walled cowl and new double-panel roof construction provide extra ruggedness and long life.

New custom cabs! Available in all 1960 cab models, they include distinctive exterior door pillar and rear belt line moldings . . . handsome chrome grille (light-duty models) . . . new Super Cushion Seat with foam seat cushion and backrest . . . sunshade, armrest, cigar lighter and control knob trim.

New compact L.C.F. models! Twenty-six new Chevrolet Low Cab Forward models with short cab design allow for maximum length trailers and extra cargo space. Short wheelbase and turning radius give exceptional maneuverability. Bumper-to-back-of-cab dimension is as short as 90 inches. G.V.W.'s go up to 25,000 lbs. and new cab design makes entering easier. And in series 50 and 60 models you can choose 6-cylinder or V8 power.

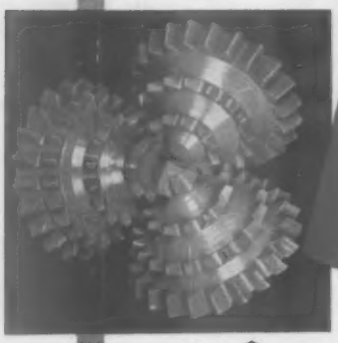
New tougher built tandems! They're the best built Chevy tandems yet with Hendrickson RT320 rear suspension, two 16,000-lb. Eaton rear axles and 7,000-lb. front suspension (9,000-lb. front suspension optional, extra cost).

And they're POWERED to improve your profit picture, too! Chevy for '60 offers a *wide* choice of better-than-ever power plants; in every weight class you can choose from famous economy 6's or V8's that lead the field for efficient short-stroke design! Three big sixes and four advanced V8's allow you to match the engine to your job for top performance.

Chevy's 1960 trucks with *total newness* are now on display at your Chevrolet dealer's, so stop by sometime soon! . . . Chevrolet Division of General Motors, Detroit 2, Mich.

CHEVROLET

with total newness!



SECURITY makes the RIGHT BIT for the Job!

For Hard Formation Drilling...

specify SECURITY "H" SERIES Bits

276 { TYPES, SIZES AND VARIATIONS

SECURITY makes a complete line of rock bits — more than 1120 types, sizes and variations. Of these, 276 are supplied exclusively for HARD FORMATION drilling.

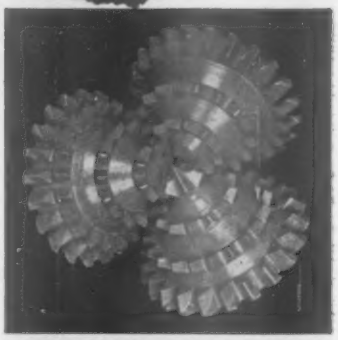
Like all Security bits, "H" SERIES *hard formation* rock bits can be obtained for either regular, jet, air, or jet-air circulation. Whatever your specific drilling requirements, specify Security and get the *right* bits for every well you drill. You will find — as thousands of others have — that Security rock bits lead in quality construction and modern design features, and are first choice for use under present-day drilling requirements.

Complete data about Security rock bits and drilling tools are contained in the 1959 catalog. Write today for your free copy.

H7

FORMATION RATINGS: For hard semi-abrasive sand, hard lime with chert streaks, dolomite, etc.

SIZES: 23 bit sizes from 5⅝ inches to 12¼ inches



H7L

FORMATION RATINGS: For hard-abrasive consolidated sandy limestone, chert-bearing limestone and dolomite, and other hard-abrasive strata.

SIZES: 6 bit sizes from 7⅞ inches to 12¼ inches

H7W

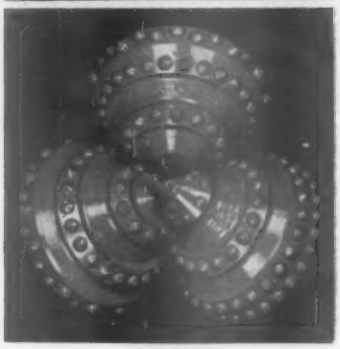
FORMATION RATINGS: For extremely hard and abrasive chert, schist, sand rock, quartzite, pyrite and granite.

SIZES: 23 bit sizes from 5⅝ inches to 12¼ inches

H9

FORMATION RATINGS: For very hard, brittle, extremely abrasive chert, flint, taconite, quartzite and basalt.

SIZES: 10 bit sizes from 6⅛ inches to 12¼ inches



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Available Through Your Favorite Recognized Supply Store

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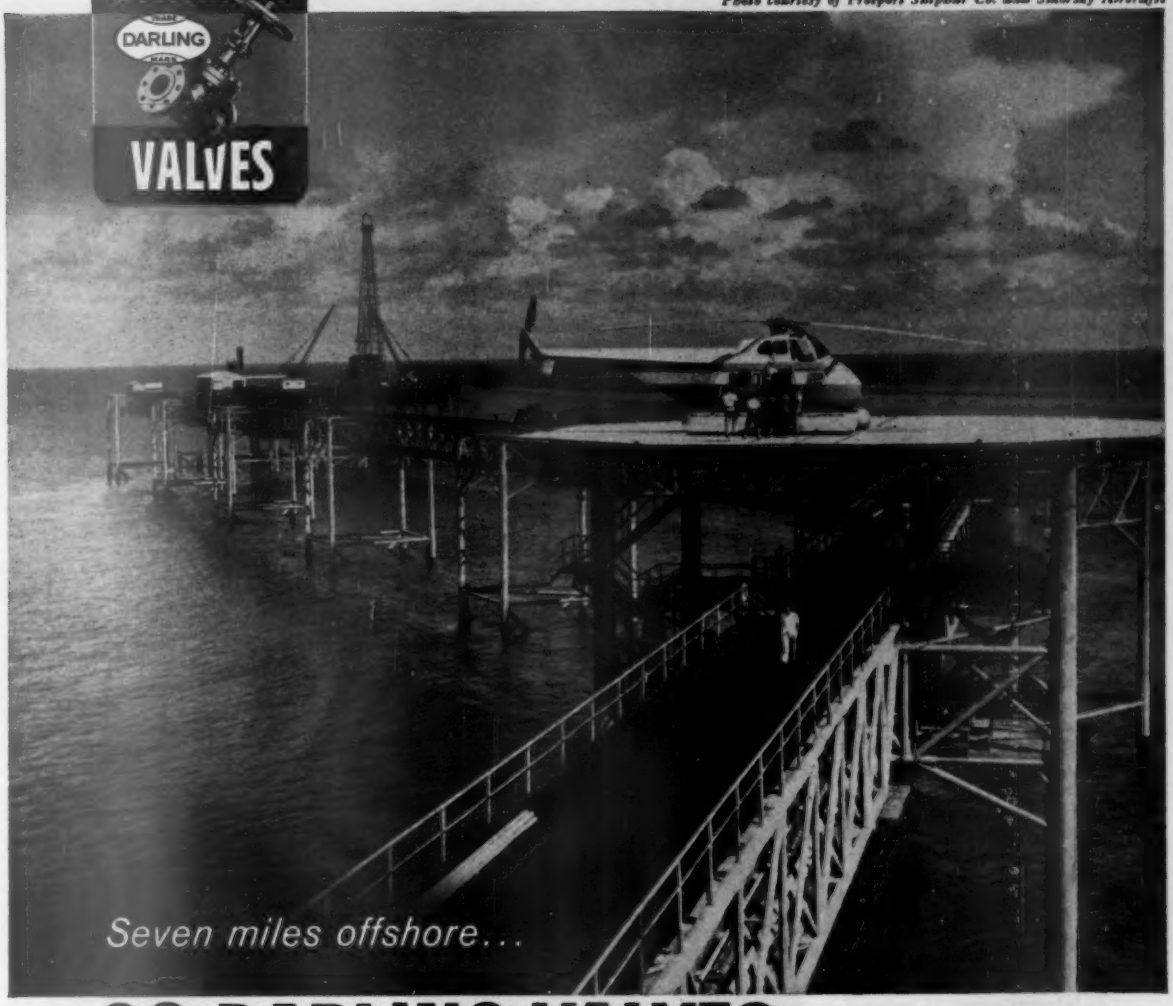
CANADA ... Security Engineering Canada, Ltd., Edmonton, Alberta, Canada
OVERSEAS ... Security International S. A., Caracas, Venezuela; London, England

DARLING

VALVES

Photo courtesy of Freeport Sulphur Co. and Sikorsky Aircraft



90 DARLING VALVES

to help tap new sulphur deposit

Above you see part of Freeport Sulphur's $30,000,000 project to tap a major new sulphur deposit. It's the world's first offshore sulphur mining plant at Grand Isle...seven miles off the coast of Louisiana in the Gulf of Mexico. Production is planned to start in 1960.

Valves on the mile-long "steel island" mining plant were supplied by Darling. They include 2" to 12" OS and Y and 6" to 10" check valves made from Ni-Resist with monel trim . . . all for use in corrosive service.

Here's another case where Darling's extensive research and development on corrosion-resistant valves helped solve a specialized operating problem. And on gate valves, Darling's *exclusive revolving double disc parallel seat feature* assures positive sealing and ease of operation at all times.

Let us assist *you* on applications where "just ordinary valves" won't do. Write or phone us about your valve requirements. Or we'll gladly have a Darling sales engineer call.

Darling OS and Y gate valve with flange ends . . . one of types being supplied for Freeport Sulphur's Grand Isle sulphur mining plant.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pennsylvania

Manufactured in Canada by Sandilands Valve Manufacturing Co., Limited, Galt 19, Ontario

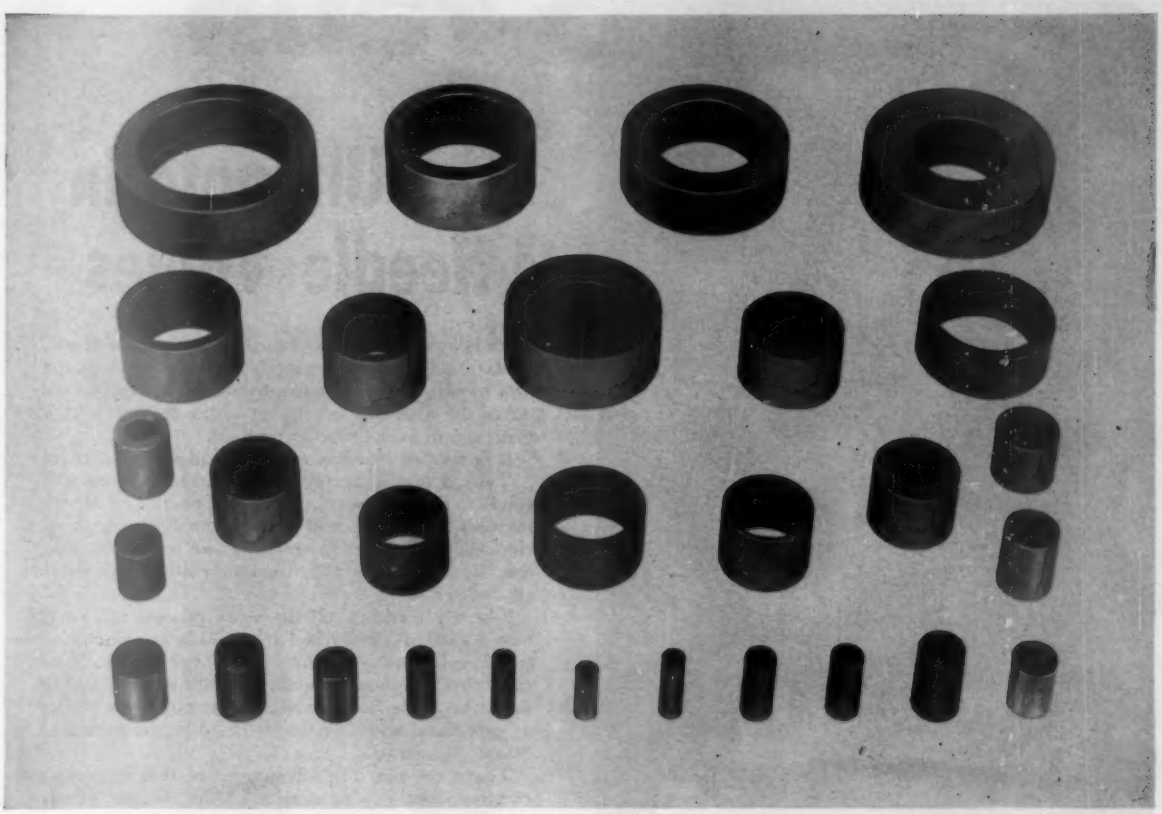
anti-stalling
anti-rust

GULF agent 178

Your customers have sure protection against carburetor icing when you stall-proof your gasoline with Gulf Agent 178. For more than four years, this additive has proved itself in millions of cars and billions of miles of service. Gulf Agent 178 is easy to use, because it is readily soluble in all petroleum products and blends easily at temperatures from minus 30° to plus 140° F. It is insoluble in water and can be used in conventional gasoline transfer systems with no danger of loss from water leaching. Gulf Agent 178 is inexpensive, too. Only 10 to 15 pounds are required per thousand barrels of gasoline. No expensive storage space is required, since quantities are so small. Lastly, Gulf Agent 178 gives you an extra benefit by providing corrosion protection at no extra cost. Rust prevention lengthens the life of distribution and storage facilities all the way from refinery to customer. Gulf Agent 178 can make your gasoline a better, more saleable product. Let us show you how. Write or phone Petrochemicals Department Sales Office, Gulf Oil Corp 360 Lexington Ave. New York 17, N.Y.

GULF

Quality Chemicals from Petroleum



2 ways to save on pressure tubing

1. **GET TIMKEN QUALITY STEEL**

When you get Timken® steel pressure tubing, you get the finest quality tubing your money can buy. Quality that assures long, economical service. And it begins in the Timken Company mill with fine alloy steel, melted in the most modern electric furnaces in this country. Experts in melting, piercing, finishing and inspection guard this quality for you using many procedures that are virtually unique in the steel industry. For example, *all* tubes are specially conditioned to assure finer finish. And backing all this technical ability are *30* years of experience in producing pressure tubing. The result is quality that assures you *the longest tube life per dollar.*

2. **LET TIMKEN COMPANY EXPERTS HELP SOLVE YOUR PRESSURE TUBE PROBLEMS**

Whatever your steel pressure tube problems—corrosion, oxidation, heat, pressure—Timken Company steel experts can help solve them. They've solved hundreds of the toughest problems in every field, from steam generators to chemical plants. From the wide range of diameters and wall thicknesses available in Timken pressure tubing, (typical examples shown above) you can select the most economical size in the right analysis for your needs.

Get quality pressure tubing that will save you money. Specify Timken steel pressure tubing. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO", *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

WHEN YOU BUY TIMKEN STEEL YOU GET . . .

1. Quality that's uniform from heat to heat, bar to bar, order to order
2. Service from the experts in specialty steels
3. Over 40 years experience in solving tough steel problems

TIMKEN® *Fine Alloy* STEEL

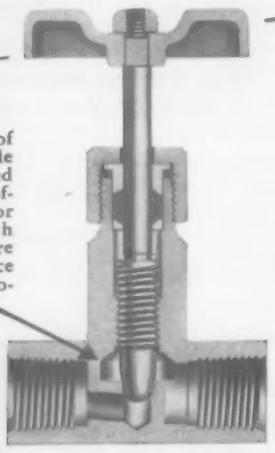
TIMKEN ALLOY STEEL AND SEAMLESS TUBING IS AVAILABLE FROM WAREHOUSE STOCK IN 44 CITIES IN THE UNITED STATES

MAXIMUM WORKING PRESSURE
10,000 PSI
for water, oil or gas

- Body and stem guide extra heavy bar stock fused into one piece.
- Valve stem 416 stainless steel.
- Packing special one-piece "Marpak" moulded ring.
- Bodies marked in accordance with MSS regulations.

ONE PIECE

The stem guides of conventional needle valves are screwed into bodies—this often causes leakage or blow-outs. Marsh Needle Valves are fused into one-piece by exclusive "Conoweld" process.



The Ultimate in Needle Valves

Here is one of the crowning achievements of Marsh research, design, and manufacturing skill. It is the first needle throttling and shutoff valve to combine *all* of the qualities called for today in this highly critical and ever broadening field.

It is a valve that has strength and safety to spare . . . rated for pressures up to 10,000 psi—equally efficient in the lower ranges. A product of Marsh instrument-making and valve manufacturing experience, it combines instrument-like precision with the ruggedness that distinguishes all Marsh valve specialties.

The illustrations tell the story of new thinking; new standards. Body and stem-guide are machined from extra-heavy carbon steel bar stock. Still greater strength and rigidity are achieved by fusing the stem-guide into the body. The complete fusion of guide and body is accomplished by the exclusive Marsh "Conoweld" process.

There are two big advantages to this one-piece construction: (1) It eliminates the danger of unscrewing the valve from the body when opening—a frequent cause of leakage, even dangerous blow-outs (2) It permits perfect line-up of threads and seat. As a result, Marsh valves are easier to operate even at high pressures.

The precision-machined stem is 416 stainless steel. Stem threads are fine pitch for extra strength and fine, controlled regulation. Notable advancements are special "Marpak" one-piece, non-binding longer-lasting packing; deep thread chambers, keeping inlet and outlet piping away from ports and contributing excellent flow characteristics. Entire packing nut and packing gland are electro-zinc plated, preventing corrosion and giving the valve a handsome, plated exterior. The rugged malleable handle is finished in heavy baked enamel.

The new needle valve line includes globe and angle patterns with double female connections in sizes ⅛", ¼", ⅜", ½", ¾" and 1". Also globe and angle valves with male inlet and female outlet in sizes ¼" and ½". *Complete stock carried at our Skokie, Illinois factory and also at our branch plant in Houston, Texas.*

Write today for catalog giving complete details.

MARSH INSTRUMENT COMPANY, Dept. L. Skokie, Ill.

Division of Colorado Oil and Gas Corporation • Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta • Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Tex.

MARSH

"THE STANDARD OF ACCURACY"

RUST-OLEUM®

STOPS RUST!®

and matches ORIGINAL EQUIPMENT

COLORS

Distinctive as your own fingerprint. Accept no substitute.

How much does rusty equipment cost *you?* With Rust-Oleum, you STOP RUST—and you match original equipment colors, too, for long-lasting protection!

We want you to see for yourself how *easy* it is to use Rust-Oleum . . . actually take the brush and see how smoothly it works, how it dries to an *attractive, high-gloss finish* that resists sun, fumes, rain, heat, snow, salt air and salt spray, and blowing dust and sand. And the same formula can be applied by brush or spray. Just check the coupon for the color you want . . . and attach it to your business letterhead for a FREE TEST SAMPLE. No cost or obligation.

Your Rust-Oleum Distributor maintains complete stocks for immediate delivery.

ATTACH COUPON TO YOUR BUSINESS LETTERHEAD FOR FREE TEST SAMPLE

CHECK COLOR TO MATCH YOUR EQUIPMENT

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Please send me a FREE TEST SAMPLE in the color checked.

- ☐ 769 Damp-Proof Red Primer
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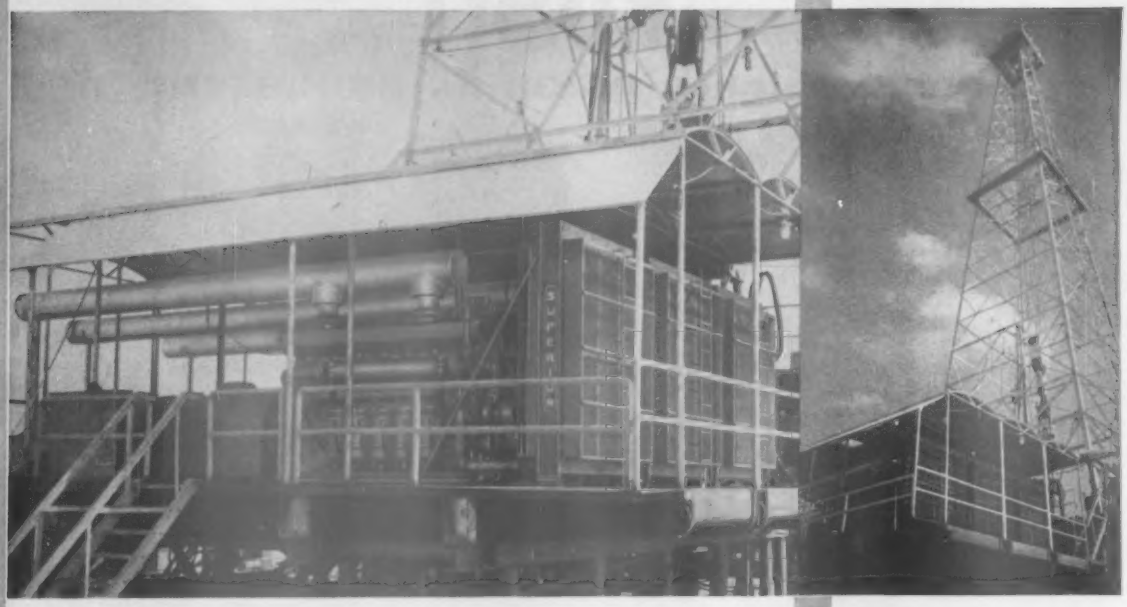
- ☐ 634 Quick Drying Black
- ☐ 2766 High Gloss White
- ☐ 470 Ready Mixed Aluminum
- ☐ H-4 Caterpillar Yellow
- ☐ 722 Bethlehem Yellow
- ☐ 728 Old Emsco Green
- ☐ 726 New Emsco Green
- ☐ 727 New Unit Rig Gray
- ☐ 724 Waukesha Gray
- ☐ 725 New National Blue
- ☐ 723 Oil Well Orange

2100 actual hp
from three compact
WHITE SUPERIOR GAS ENGINES



. . . power drawworks and mud pumps on
HELMERICH & PAYNE'S BIG RIG 47!

■ Among the forest of giant rigs that spear the Oklahoma landscape, none are bigger than Helmerich & Payne's Rig 47. This new 20,000 foot class rig, designed especially for deep drilling in the Anadarko Basin, is dependably powered by White Superior 8G-825 gas engines. These three rugged, high-quality 8-cylinder engines are compounded to supply 2100 actual HP to drawworks and mud pumps, or can provide 1800 HP continuously for the mud pumps alone. With the split section "Oilwell" compound, the simply-designed, compact Superior power units and drive equipment are easily portable.

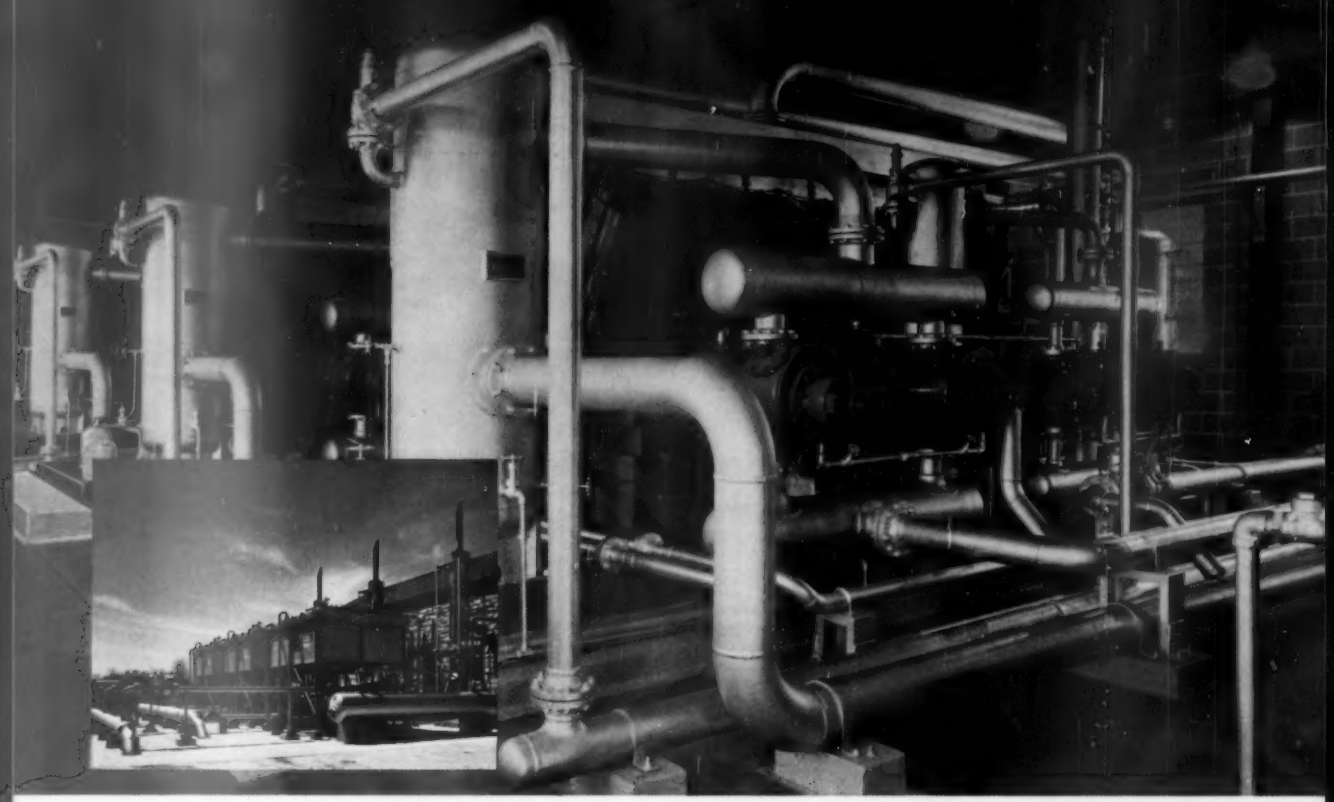
Superior gas engines are precision-built for faster, deeper drilling. Their tremendous power, quick response and smooth performance are coupled with extreme operating economy, both in fuel and maintenance. Specially designed for use of natural or LP gas fuels, the highly efficient combustion system achieves low fuel consumption and resultant fuel cost savings. Minimum wear of critical internal parts results in a long life of trouble-free service.

Superior Engines · ATLAS Imperial Diesel Engines · White Diesel

White Diesel
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio

White's Superior engines range from 190 to 2150 BHP, and operate at high efficiency within their full, published rpm ranges. *Superior's performance ratings are conservative and indicate actual h.p. available . . .* not a non-usable maximum rating. No correction is necessary to 1500 ft. elevation and 90° F. They are profitably used in drilling, production and pipe line pumping, compressor drives and field electric power. Get complete information today from leading rig manufacturers, White oil field representatives or through White Diesel Engine Division!

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



Horizontal radiators are cooled by hydraulic motor driven fans powered by pumps V-belted to sheaves on the end of each engine crankshaft.

Laclede Gas Company's Gas Storage Project—equipped with three Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors. Units have Young radiators with gas, lubricating oil and engine water cooling sections. Other Beaird compressors from 120 to 660 h.p.

PACKAGED COMPRESSORS STORE WINTER'S RESERVE GAS SUPPLY FOR ST. LOUIS

IN ONE of the largest and most successful projects of its type, Laclede Gas Company of St. Louis is pumping billions of cubic feet of natural gas into sandstone that never held gas before. This additional supply will meet peak load demands enabling the company to heat additional thousands of St. Louis homes this winter.

Three Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors are taking up to 16 MMcfd, delivered by pipeline from Louisiana, compressing it through two stages from 50 to 125 psi. suction to 655 psi. discharge. The gas is injected down 1400-1500 foot wells into a natural sandstone reservoir bed.

Gas interstage and after cooling is provided in sections of the horizontal radiators mounted outside the compressor building. Use of electric motors to drive auxiliary equipment has been eliminated wherever possible. Pumps for engine cooling water, lubricating oil and radiator hydraulic fan motors are all driven off the compressor.

LOWEST COST PER HORSEPOWER INSTALLED

BEAIRD
another AMF product
PACKAGED COMPRESSOR PLANTS

Packaged Compressors are just one of the many products manufactured by Beaird for the petroleum and petrochemical industries. When you are in the market for new equipment or assistance in developing a specialized product . . . contact Beaird for a qualified appraisal or quotation.

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Shreveport, Louisiana

A Subsidiary of American Machine & Foundry Company

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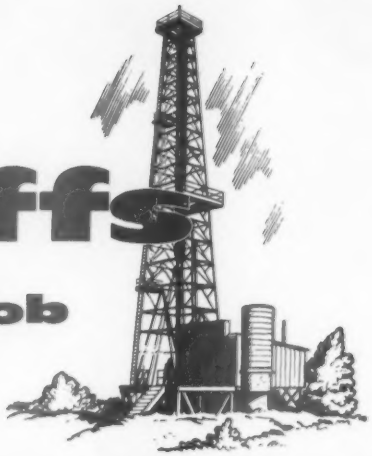
Power Take-Offs

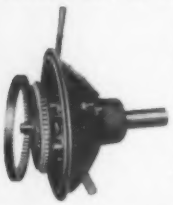
for every oilfield job



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

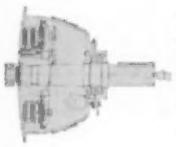
Twin Disc Friction and Fluid PTO's — the world's most complete line

STANDARD FRICTION PTO



Easy-to-mount unit consisting of clutch PTO assembly with shaft and bearings in a rigid cast iron housing. Designed for manual operation on all internal combustion engines with standard SAE flywheel housings from No. 6 to No. 00. Triple-plate 14" to 21"; double-plate 11½" to 24"; single-plate 6½" to 24". Twenty models with horsepower capacities to 600 hp and torque capacities to 6730 lbs.-ft.

AIR-OPERATED PTO



A new series combining the convenience of Model PO Air Clutches with the time-tested dependability of Twin Disc Friction PTO's. Ideal for drilling rigs where the operator must work from a remote driller's platform. A touch on a control valve handle engages and disengages the clutch . . . provides "torque without effort." Normally requires only 90 psi air pressure. Capacities to 600 hp. Conversion kits available.

"LIMITED ATTENDANCE" FRICTION PTO

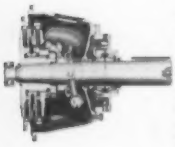
(Illustrated less housing)

A modified version of the standard Twin Disc PTO. Features a new clutch engagement mechanism that virtually eliminates throw-out collar wear, ends daily greasing for good. In oilfield pumping jack service this PTO will quickly pay for itself in labor savings alone because it needs greasing only twice a year. Available in 10", 11", 14", and 18" sizes. Conversion kits for older PTO's also available.

FLUID PTO (Model HU)

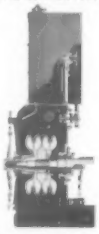
Used on constant-speed, constant-torque drives where efficiency of 95% or better is desired. Consists of a fluid coupling combined with a cast bell housing, bearings and output shaft. In oilfield pumping installations, Model HU improves engine operation by reducing variation in engine rpm per stroke by as much as 50%. Also cuts engine vacuum variation for lower BMEP. Sizes: 14.5, 17.5 and 21.

NEW "HIGH-ENERGY, HIGH-SPEED" PTO



A recent Twin Disc development for engines developing 300 to 500 hp at speeds up to 3380 rpm. Designated Model IBF-214P, it has a unique ventilated center plate that permits air flow to dissipate excess heat. An amazing ability to withstand high-energy loads makes this PTO well suited to applications where equipment is subject to heavy starting loads. Tapered roller bearing is continuously lubricated with oil. Improved throw-out collar design permits extending greasing periods up to six months.

DISCONNECTING FLUID PTO (Model HUD)



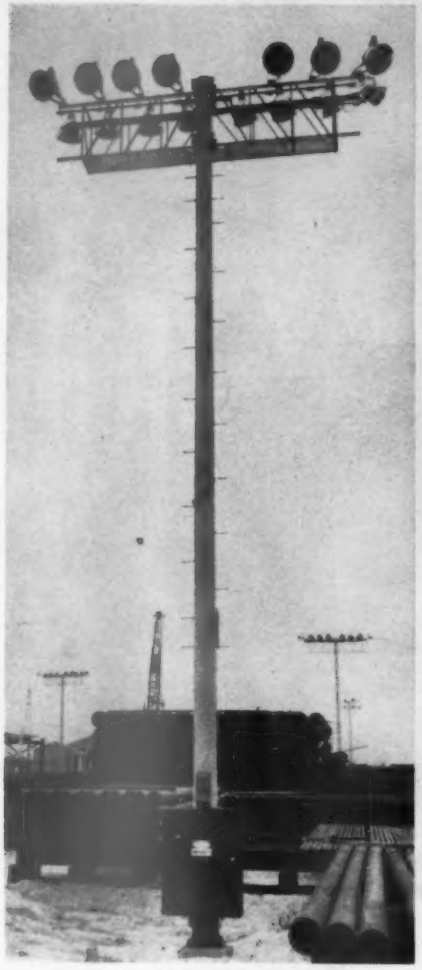
Disconnects power source from driven equipment to reduce impact shocks 70% or more. Eliminates "engine fighting" to assure balanced distribution on compounds. Life of chains, clutches and other running parts is almost doubled. Isolation of torsional vibrations and elimination of slow-speed lugging saves wear and tear on engine. Furnished with 21" or 27" double-circuit fluid couplings for engines with #0 and #00 housings in the 100 to 600 hp range.

For product information and application recommendations contact our Racine office or the Twin Disc Factory Branch, 1511 Turtle Creek Blvd., Dallas 7 (phone Riverside 1-3014).

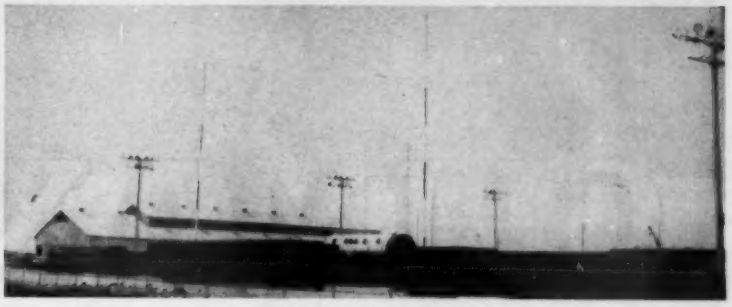
TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

You can depend on purchased electric power for

AUXILIARIES



Electrically operated solenoid on flowing well with valve controlled by electric time-clock.



Lighting for oil company pipe storage yards and rail unloading areas.

Typical of thousands of auxiliary applications of purchased electric power... the photographs above indicate the varied use of electricity in the petroleum industry. The dependability and economy of utility electric power is fast proving the answer to many problems in oil producing, transporting and refining. Contact your nearest utility electric power company for full cooperation.

Purchased Electric Power . . . saves money, manpower, maintenance, and serves you better automatically

Petroleum Electric Power Association

P. O. BOX 35005, DALLAS 35, TEXAS

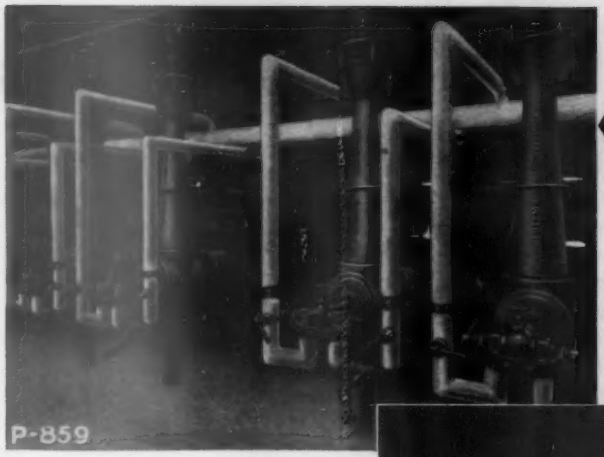
COMPRESSOR POWER
you can depend on

CLIMAX V-125 ENGINE
drives Wilson Supply--Ingersoll-Rand packaged compressor in Southeast Texas

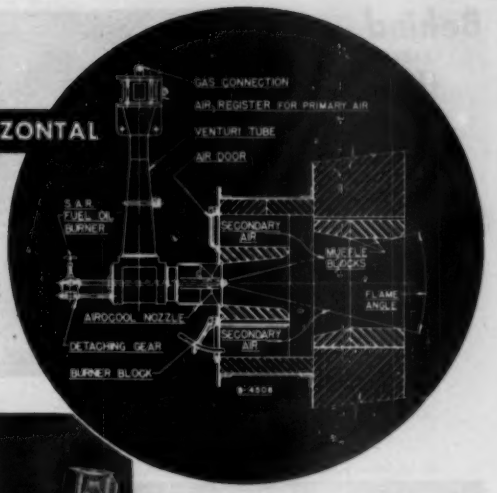
In the Hewit & Dougherty plant near Refugio, Texas, this Climax Engine has given continuous satisfaction powering a Wilson Supply—Ingersoll-Rand 12-in. x 13-in. low pressure cyl., 6″ x 13″ high pressure cyl. packaged compressor which requires 300 bhp. It's a V-125 Climax 3711 cu. in. engine—V-type, 12-cylinders, 7½-in. bore x 7 in. stroke, burning natural gas or propane with equal efficiency and great economy. From its six separately cast dual-cylinder blocks with renewable sleeves, to the cylinder heads' high compression combustion chambers, it's built for that **reliability** so repeatedly proved in hundreds of compressor installations. Send for literature.

CL-108

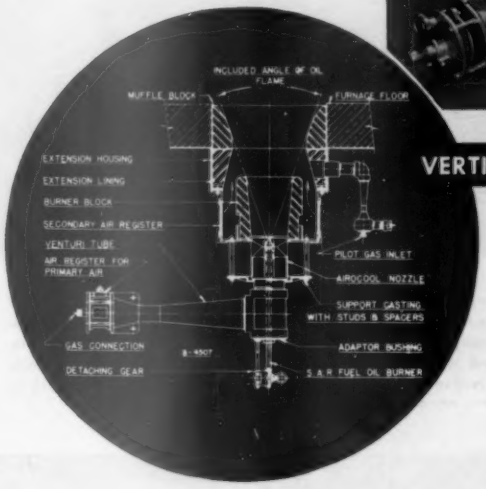
CLIMAX ENGINE MANUFACTURING CO. • FACTORY—CLINTON, IOWA
DIVISION OF WAUKESHA MOTOR COMPANY



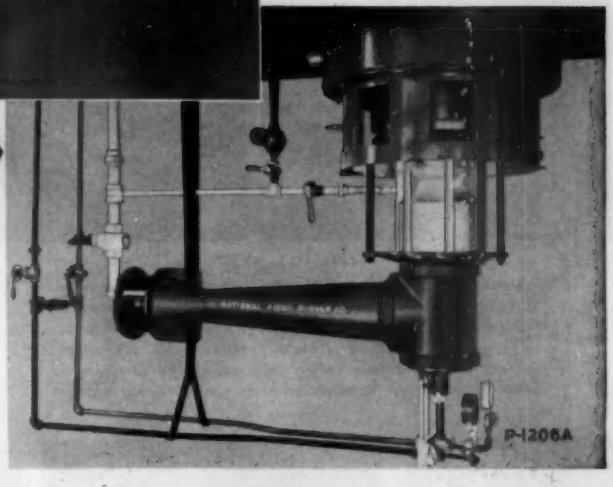
HORIZONTAL



CENTER WALL UPDRAFT



VERTICAL



A complete line of thoroughly proved burners for oil, gas, sludge also waste gas

. . . as used in petroleum refineries, chemical and asphalt plants throughout the world.

Whether the application is for boilers, stills or pipe heaters (vertical or horizontally fired) we have the ideal burner equipment for: high efficiency, low maintenance, trouble free performance.

Our engineering department is ready to cooperate with you.

National Airoil

NATIONAL AIROIL BURNER

BURNER COMPANY, INC.

Main Office & Factory: **1236 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.**

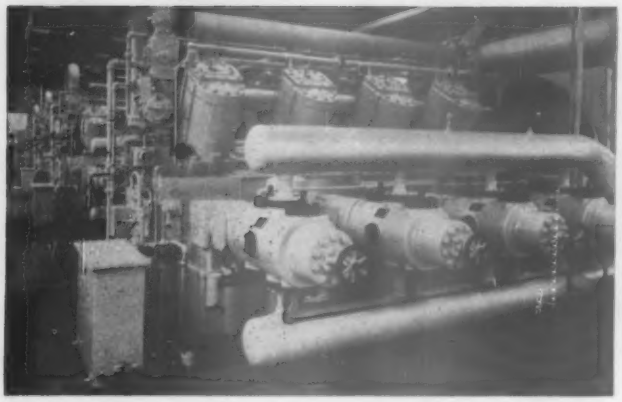
SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD, HOUSTON 6, TEXAS

Behind this symbol

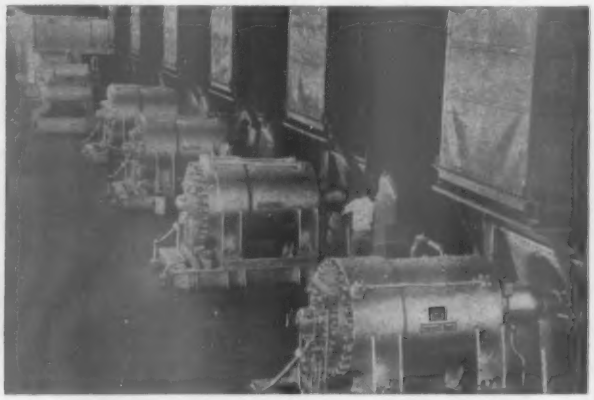
... a century of service

Here's what it means to

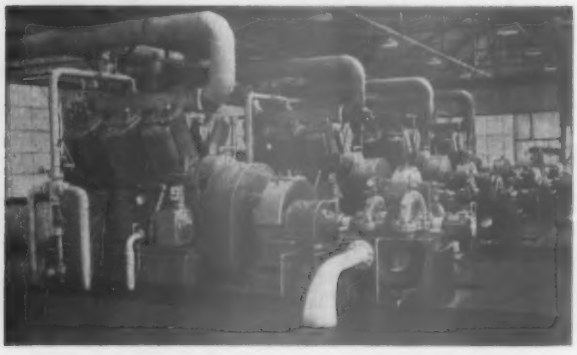
DRILLING and PRODUCTION MEN...



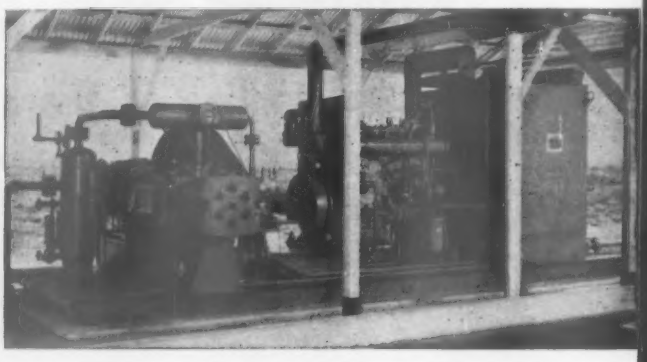
Ingersoll-Rand builds 4-cycle V-angle engine-compressors from 120 to 2000 hp and larger, for all field and production services. Their smooth, long-run operation through a wide range of loads and speeds makes them especially suitable for production services. Above are four 440-hp SVG gas-engine compressors operating at 700 psi on a southwestern gas gathering system.



Large volumes of gas for repressuring and conservation can often be handled to best advantage by Ingersoll-Rand centrifugal compressors. Units are available for any desired capacity, pressure, and type of drive. Above are 12 gas-turbine-driven I-R units, injecting up to 300,000,000 cfd of gas at 1800 psi to increase oil recovery and conserve gas.



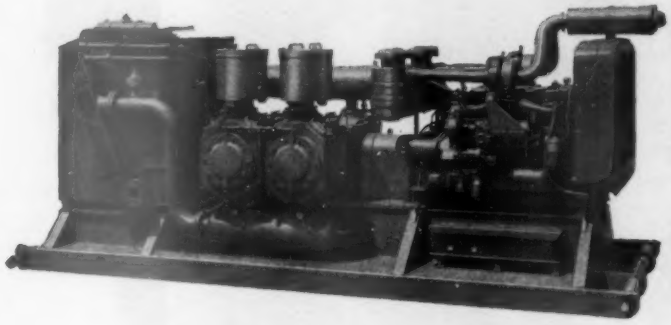
Here are four Ingersoll-Rand multi-stage centrifugal water injection pumps driven by 408-hp Ingersoll-Rand PSVG gas engines on a water flooding project. I-R centrifugal pumps are built in sizes and capacities to meet all process and natural gasoline plant requirements, and for water flooding, water supply and cooling water services. The 4-cycle V-angle engines range from 200 to 2000 hp and larger, for any prime mover application.



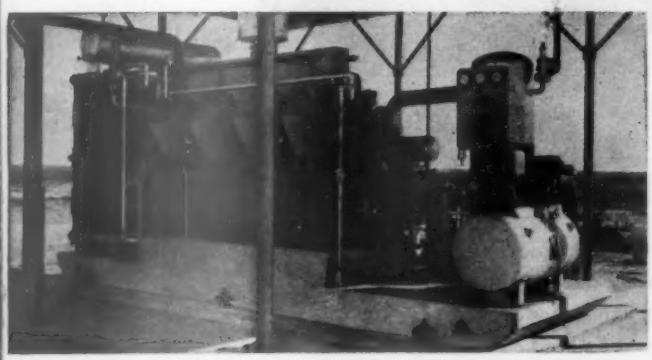
Ingersoll-Rand builds many types of compressors for gas lift, gas gathering, and other services that require tough heavy-duty units which can be moved from one location to another. Shown above is a 160-hp horizontal ESH compressor, skid-mounted with engine, cooler, and accessories. At right is a 240-hp JVG gas-engine compressor, "packaged" with cooler, starting-air compressor, and other auxiliaries.

to the oil industry:

Soon after Colonel Drake discovered oil at Titusville, the history of Ingersoll-Rand began with the manufacture of Cameron reciprocating steam pumps. A few years later, other I-R "ancestor" companies began building compressors and rock drills. Ever since that time Ingersoll-Rand has been growing with the oil and gas industries. Today I-R provides the widest range of compressors, pumps and other equipment for the production, transmission, and processing of oil and gas and their products—the I-R monogram is more than ever a symbol of leadership and progress.



Shown above is a completely self-contained Ingersoll-Rand skid-mounted compressor plant designed especially for air drilling. These rugged new packaged units include continuous-duty I-R two-stage balanced-design compressor, diesel or gas-engine drivers, and combination forced-air cooler all on one highway-width steel skid. In operation they are completely automatic and self-protecting—maintenance is minimized.



I-R MILESTONES OF PROGRESS
have had a far-reaching effect on the petroleum industry

1860 The first Cameron pump—a reciprocating steam pump which found wide use in the petroleum industry.

1871 Simon Ingersoll's steam-powered rock drill.

1872 Heavy-duty reciprocating compressors.

1902 The first portable compressor.

1906 The first direct-connected synchronous-motor-driven compressor.

1912 First centrifugal compressor for 90-psi air, and powered by I-R turbine.

1913 Centrifugal pump.

1920 Oil-engine compressor engineered as a unit; solid fuel injection.

1924 Large 4500-psi compressors for ammonia synthesis (still operating).

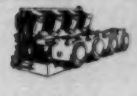
1927 Centrifugal pipeline pump; mechanical shaft seal.

1928 Barrel-type hot-oil charging pump for refineries.

1930 First compressor for 15,000 psi on commercial scale.

1931 Close-coupled Motorpump.

1931 First centrifugal gas pipeline compressor, "canned" with 3000-hp motor.



1933 Famous XVG gas-engine compressors combined multiple power cylinders and compressor cylinders on single frame.

1933 First non-lubricated compressors.

1935 Channel Valves set new standards for compressor valving, unmatched to this day.

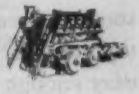
1937 Complete line of vertically-split centrifugal process pumps.

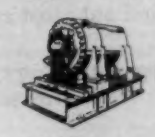
1940 First fluid cat-cracker main air blower.

1947 First high-pressure centrifugal compressor for gas transmission

1949 First centrifugal gas compressor for cat-cracking.

1952 First turbo-charged gas-engine compressor, the 2000-hp KVS.





1954 First centrifugal compressor for 2000 psi.

1955 Compressor built for 35,000 psi on commercial scale.

1958 Highest-pressure centrifugal pump—6500 psi.

Ingersoll-Rand

14-881 11 Broadway, New York 4, N. Y.

In engineered products, there's no substitute for experience

No draft
No machining

BETHLEHEM FORGES THIS
HIGH-PRESSURE STEAM TRAP WITH NO DRAFT

There's not an ounce of useless metal to pay for—or machine away. Our customer saves a good many metal and machining dollars. Chances are, Bethlehem's unique ability to forge with one degree drafts *or less* can help you save, too. It's easy enough to find out. Just call or write our nearest sales office.

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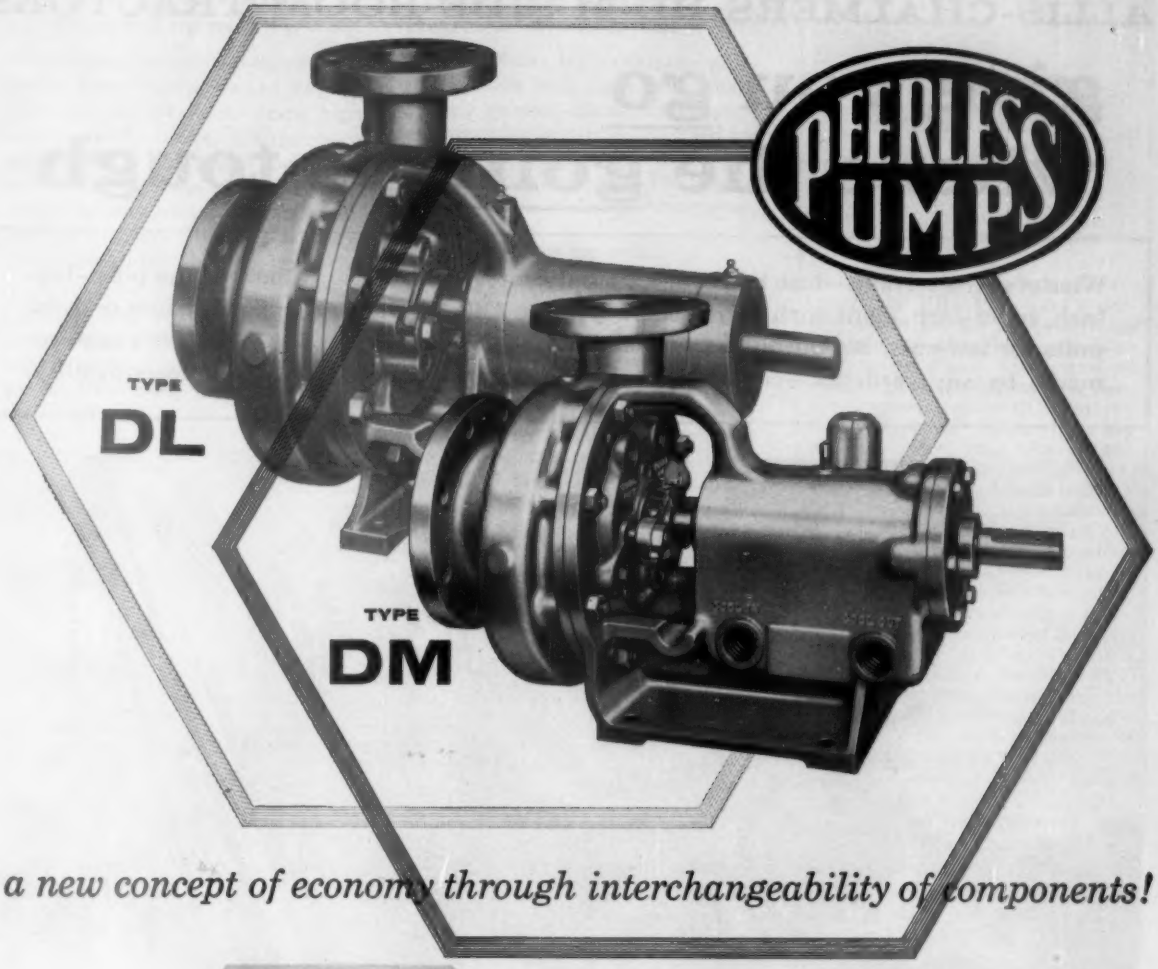
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



a new concept of economy through interchangeability of components!

PEERLESS PUMPS

INTEGRATED ∫ DESIGN ∞

∫ SUPERIOR DESIGN + TOP QUALITY CONSTRUCTION
+ MAXIMUM INTERCHANGEABILITY
+ OPTIMUM MATERIAL GROUPS AVAILABLE

= BROADEST HYDRAULIC COVERAGE WITH MINIMUM CUSTOMER INVENTORY OF PUMPS AND COMPONENTS

ACCESSIBILITY—Through ease of assembly and disassembly if and when required. **DURABILITY**—Through use of any machinable metal as materials of construction. **SERVICEABILITY**—Through designs that feature maximum ease of maintenance. **INTERCHANGEABILITY**—Through a choice of semi-open or enclosed impellers, oil or grease lubrication, air- or water-cooled back plates and bearing housings. **RELIABILITY**—Through the high performance standards set for these pumps, proving more than ever before, that Peerless Builds Dependable Pumps. **AVAILABILITY**—Shipment from stock of both complete pumps and pump components.

CAPACITIES: UP TO 1000 GPM • **WORKING PRESSURE:** UP TO 300 PSIG
HEAD RANGE: UP TO 430 FEET • **TEMPERATURE RANGE:** UP TO 450° F

Putting Ideas to Work

fmc FOOD MACHINERY AND CHEMICAL

Peerless Pump Division

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Visit us in Booth 831 during the Chemical Show, Coliseum: New York, Nov. 30 - Dec. 4, 1959

ALLIS-CHALMERS HD-21 SIDE BOOM TRACTORS

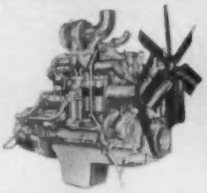
give you go where the going is tough

Whatever the terrain—dust bowls, swamp holes, steep hillsides . . . whatever the pipe—big-inch, super-inch, giant-inch . . . you can depend on Allis-Chalmers HD-21 side boom or dozer units for low-cost, big-output performance. HD-21's measure up to a pipeliner's requirements by any yardstick—capacity; clearance; flotation; day-in, day-out dependability.

...move ahead with **ALLIS-CHALMERS**

The Allis-Chalmers HD-21 . . . measures up with POWER

Here's power to spare—deep-chested, *usable* power pipeliners can depend on to get the job done—come high water, mud, rocks, 100-percent slopes, any of the tough conditions common in pipeline work. In every Allis-Chalmers tractor, direct electric starting on diesel fuel saves hours of productive time.



Power for the HD-21 pipeline tractor—the new Allis-Chalmers 21000 Turbocharged Diesel Engine with 225 net engine hp at 1825 rpm.

. . . measures up with clearance and flotation

Allis-Chalmers high-clearance pipeline tractors walk right over rough, bumpy ground. Excellent balance and maximum ground contact distribute tractor weight for better flotation and stability—keep the tractor moving even in the softest going.

. . . measures up with unsurpassed smoothness

Hydraulic Torque Converter Drive—pioneered and proved in Allis-Chalmers crawler tractors years ahead of any other make (since 1940)—delivers smooth, cushioned power; automatically matches tractor speed to the load. Operator gives full attention to boom work and signals, never needs to shift. Hydraulic cushioning protects the entire power train and side boom from sudden load shock and strain.

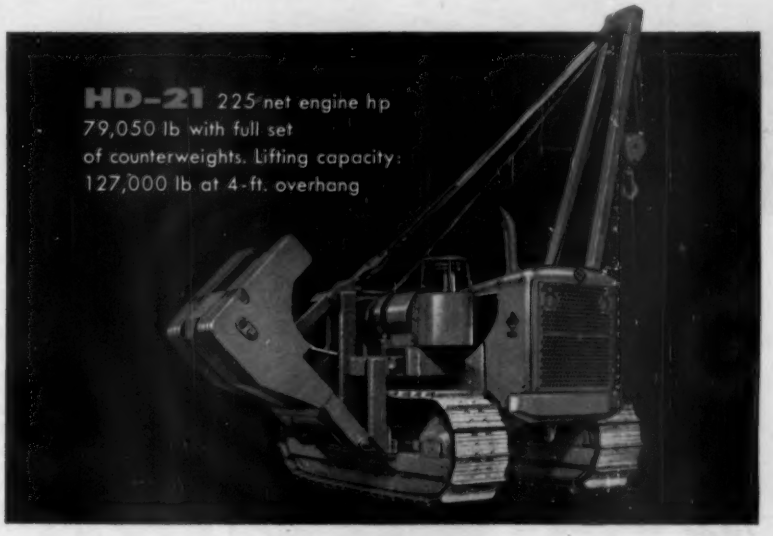
. . . measures up with outstanding control

Heavy-duty side booms on Allis-Chalmers pipeline tractors give you safe, sure pipe handling. Controls are positive-acting, mounted in needle bearings for easy operation and ideally arranged for operator convenience. Internal-expanding brakes, completely enclosed for protection from dirt and moisture, control load line and boom line drums. Safety features include drop-proof, counterweight linkage, cable guards, locking winch controls, heavy-duty jaw clutches in winch drum drives.

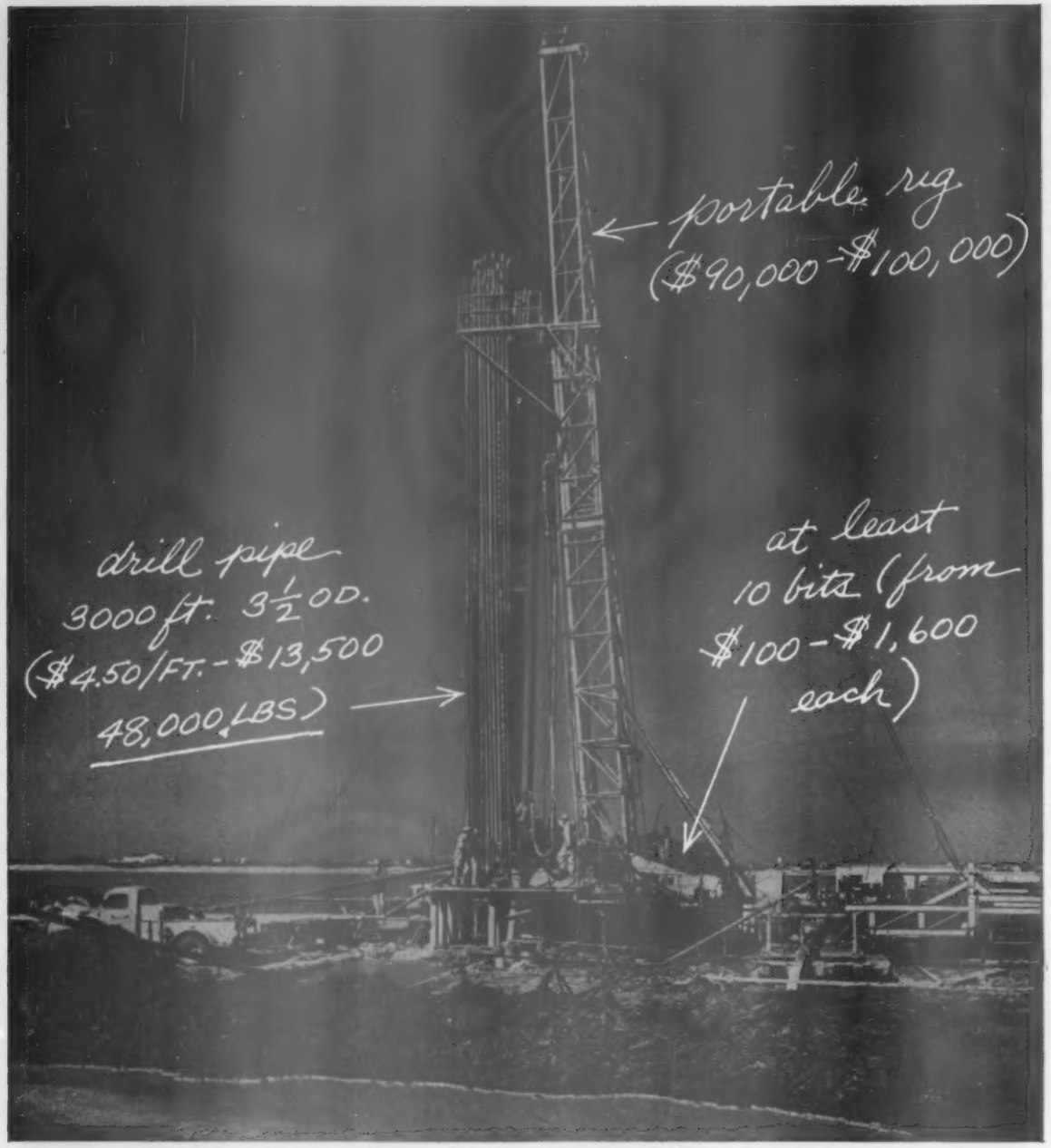
Now . . . Allis-Chalmers announces PERMA-SAFE lubrication for all models in its crawler tractor line...climaxing more than 20 years of constant research and on-the-job experience with Positive Seal, tapered roller bearing design. Now you can forget about greasing front idlers, support rollers, truck wheels . . . convert that lost time to profit time. Allis-Chalmers certifies that these components were lubricated at the time of assembly and that they need no further greasing . . . regardless of weather or terrain conditions under which they may have to operate. Allis-Chalmers, pioneer of extended lube intervals, lets you take this big step ahead with complete confidence.

Three Allis-Chalmers side boom tractor models give you a choice of sizes and capacities to fit any job. Your Allis-Chalmers dealer will be happy to show you these machines in action. Give him a call right now!

ALLIS-CHALMERS
CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN



...power for a growing world



When you spend $90,000 for a drilling rig you've got to use the best rope available →

The best long-run, moneysaving rope. The high cost of portable drilling rigs excludes the "wise" buying of any rope below the quality level of Roebling Royal Blue. Anything less will cost you *more*, in replacements, delays, frustration.

Royal Blue is a product of America's oldest wire rope manufacturer. It is made from the toughest rope wire ever produced—Type 1105—extra high-strength improved plow steel. Preformed Royal Blue has a flexibility that curves around replacement costs and leaves them dormant. It is the strongest wire rope you can buy and use . . . for a long time.

You need exceptional resistance to shock, abrasion, fatigue and impact. You need around-the-clock ruggedness. Your Roebling distributor has what you need—Roebling Royal Blue. Get it and save. Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey, will send you details. Write.

ROEBLING

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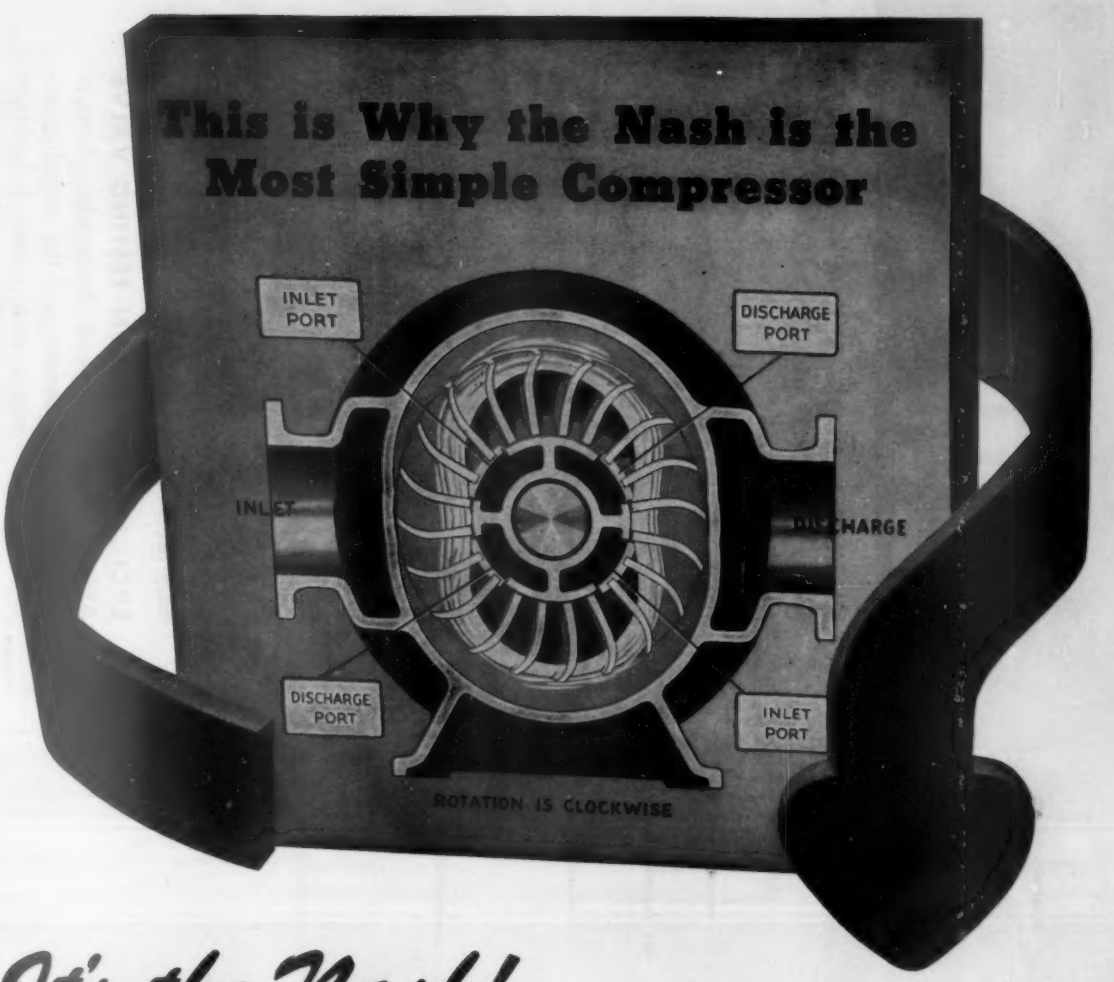

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

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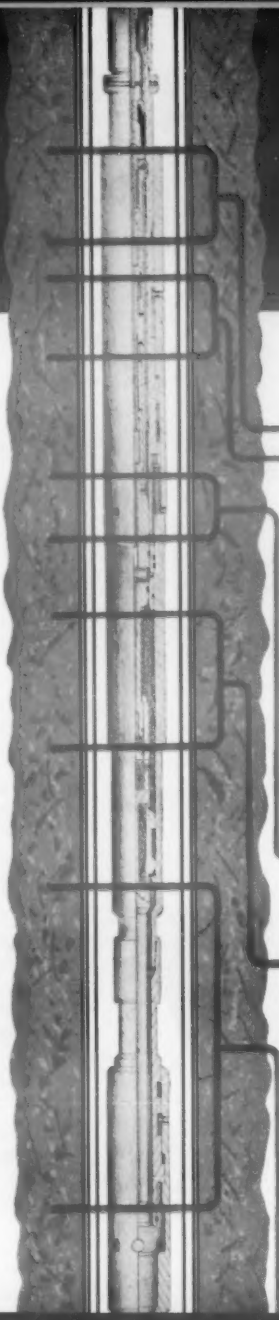
NEW

JOHNSTON TESTERS FULL-BORE TEST AND COMPLETION TOOL

Now, you can make all the savings in round trips and rig time that result from using a combination test and completion tool without the disadvantages that sometimes result.



NEW

THE UNIQUE LOCKING SYSTEM makes it possible for the testing valve assembly to hold pressure in either direction; therefore, tubing or drill pipe may be pressured-up at any time while going in the hole without the use of any additional equipment.

TEST VALVE IS EASY TO OPEN—Simply pick up on tubing, torque slightly to the right and set down. The action is positive and there is no chance of "getting lost" by extensive rotation.

VALVE SYSTEM OFFERS MANY ADVANTAGES—**First,** initial shut-in pressure can be taken very quickly with only a minimum flow of formation fluid. **Second,** since the test valve closes before the circulating valve opens, mud from the annulus cannot contaminate the formation. **Third,** valuable rig time is saved because you can reverse circulate while taking shut-in pressures. This "circulating" feature also keeps sediment from collecting on top of the testing valve assembly for easy retrieving.

EXCLUSIVE JOHNSTON TESTING VALVE ASSEMBLY is rugged and dependable. Because of the valve arrangement and the recording assembly, you can take as many bottom hole shut-in pressures as you want without returning test section to surface. This means more information from your test. Later tests may be made by simply pumping the test section back in place.

***No rotation is necessary* with this tool during drill stem testing operations.**

You can take as many bottom hole shut-in pressures as you want without returning the testing valve assembly to surface.

You can also squeeze cement, re-perforate, fracture or acidize without ever pulling the tubing or drill pipe.

Then, if you need later tests, you can pump the pressure test section in place without ever making a round trip.

You can do all these things with full assurance that you are using a positive tool that is completely safe in operation. There is no guesswork. All operations involve simple up-and-down movement or a minimum of right hand rotation. No damage results from excessive rotation. No left hand rotation is ever required.

After all operations are completed, a built-in jar assures packer unseating when unseating is desired.

In addition, this tool is backed by Johnston Testers —the largest operator in the field of drill stem testing. You get all the advantages of Johnston's unparalleled experience when you specify the *Johnston* Test and Completion Tool. Fill out the coupon or drop us a note on your letterhead for full information. Please refer to bulletin number A6.

Please send me complete information on the New Johnston Full-Bore Test and Completion Tool.

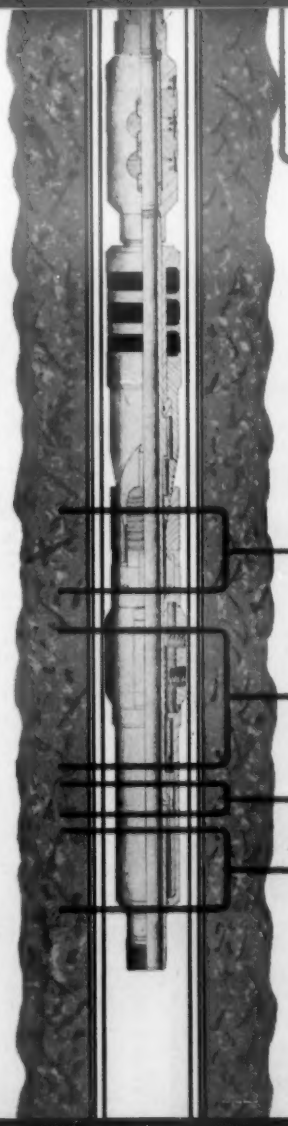
NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

A-6



JOHNSTON TYPE "T" PRESSURE RECORDER gives unfailing accuracy, sensitivity and dependability under all testing conditions. This recorder is built to withstand unavoidable oil field jolts and is not apt to be knocked out of calibration. Non-tension type recorders may.

TWO-WAY ANCHOR SLIPS enable the operator to take a strain on the tubing without unseating the packer.

BUILT-IN JAR makes it easy to unseat packer. As in all other operations, no left hand rotation is required to operate or reset.

SIMPLE SETTING OF PACKER. Just pick up, torque to the right and slack-off, and the packer is set. The by-pass valve, which is closed when the packer is set, has a simple and positive opening and closing action.

FULL OPENING THROUGH TOOL (when testing valve assembly is out) permits perforating, squeezing, and other operations without difficulty.

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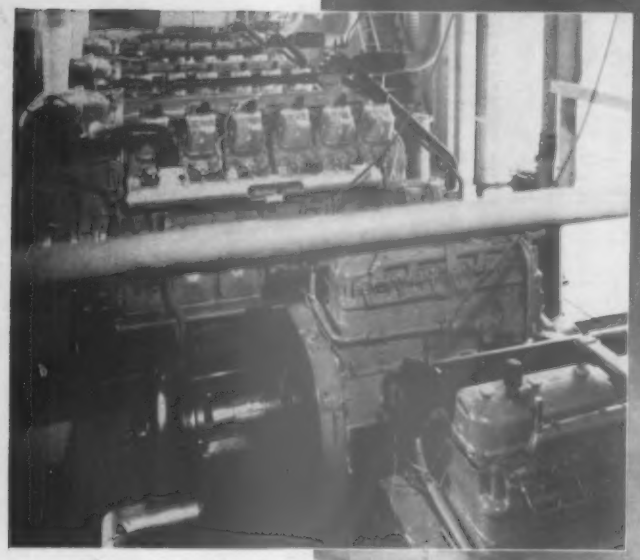
On the drilling barge "TEXAS"

All the Power is WAUKESHA

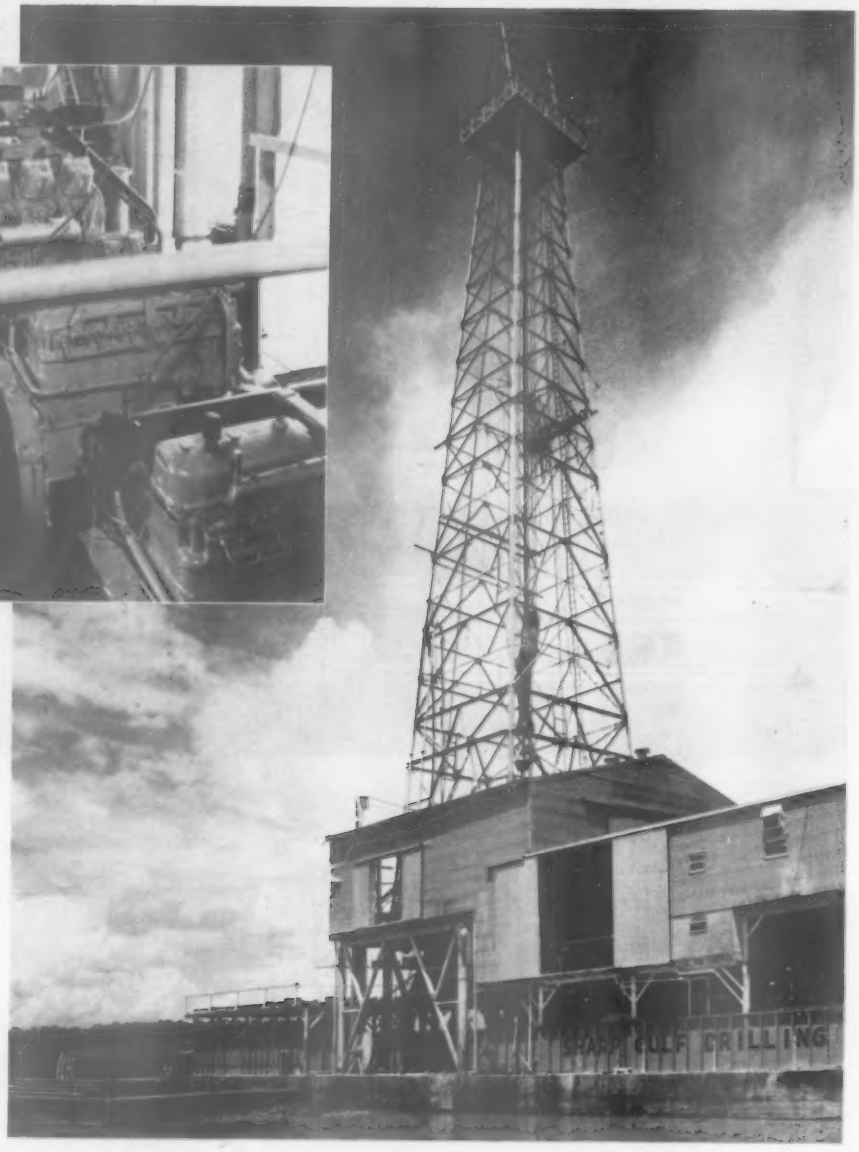


Three Waukesha turbocharged Diesels for drilling and pumping

Two Waukesha Diesel Enginators supply all electrical needs

•

Drilling barge "Texas" is owned by Sharp Gulf Drilling Co., Inc. New Orleans, La.



Drilling at Texas Gulf Producing Co. location near Bourg, Louisiana, the drilling barge "Texas" . . . owned by Sharp Gulf Drilling Co., Inc., New Orleans, Louisiana . . . is all-Waukesha powered. Driving through a Model A295-100-12 National torque converter, three Waukesha Model VLRDBS Turbo-Supercharged Diesels—12-cylinder, 60-degree vee, four-cycle, 8½ x 8½-inch bore and stroke, 5788 cubic inch displacement, with counterbalanced crankshaft—power the Model B3661 Bethlehem drawworks and two 8-inch bore x 16-inch stroke Model B1640 Bethlehem pumps. Two 100 KW Model WAKDU Waukesha Enginators (engine generator sets) supply all electrical requirements. Send for descriptive bulletins 1663 and 1648.

448

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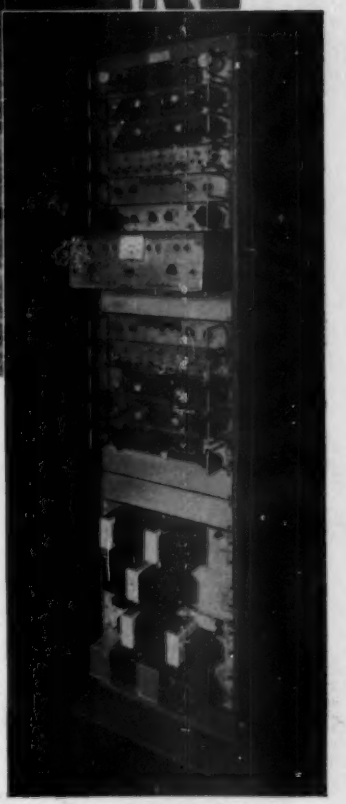

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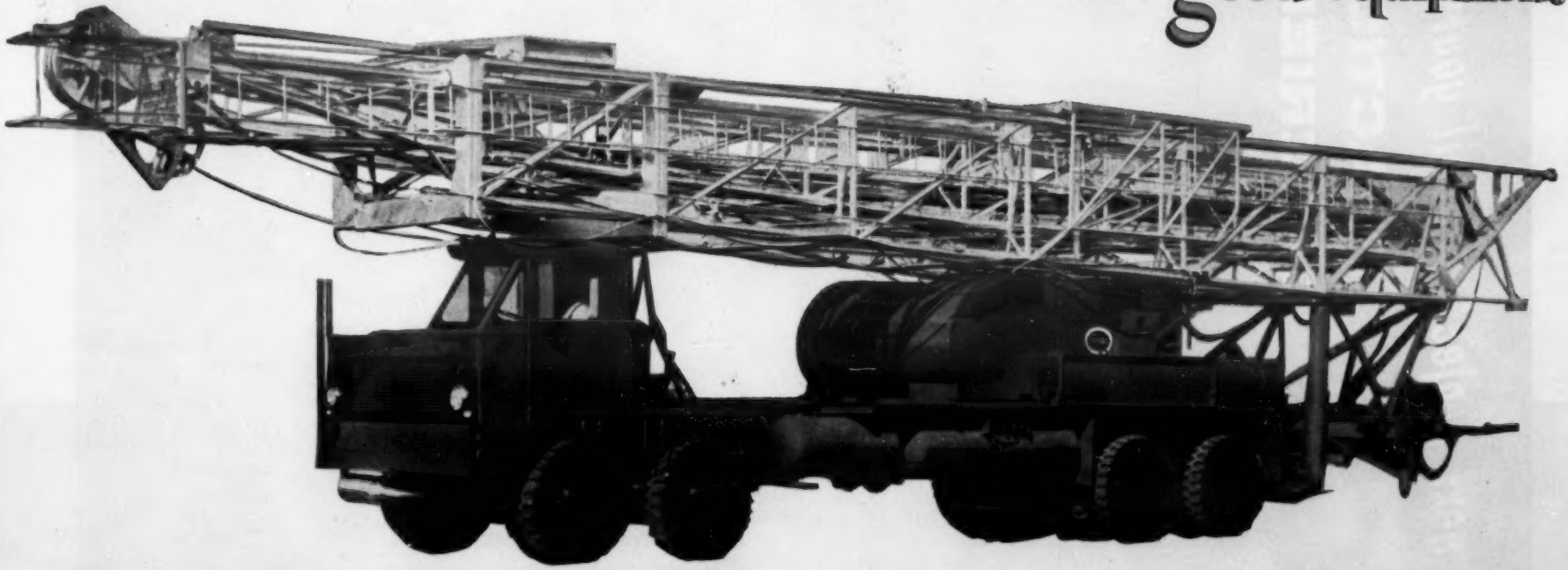

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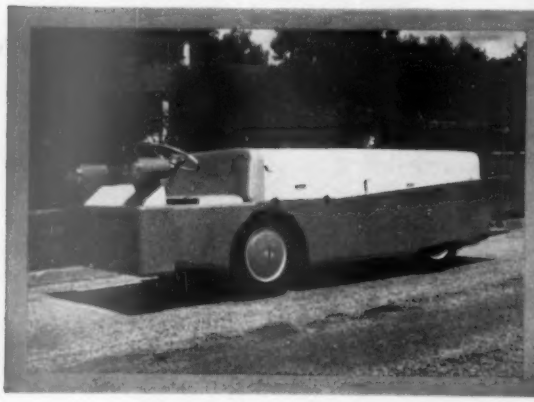

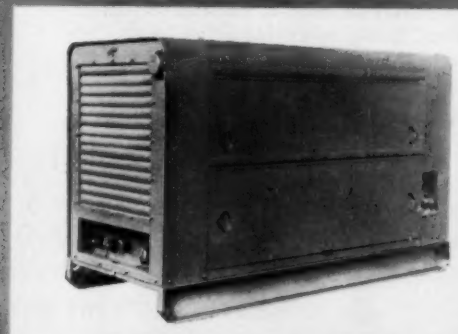

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PNEUMATICALLY OPERATED PISTON

Power: Delivers same power in either direction at any point of the stroke.

Speed: For example, the size 60 gives you 1.5"/sec. stroking speed.

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Only Fisher gives you this wide selection of actuator-body combinations. This small, compact piston actuator incorporates its own positioner mounted integrally on top of the cylinder. Positioner receives any of the normally used pneumatic instrument signals. Then, without an air set, actuator utilizes the full potential of the available instrument air or gas supply (up to 150 psi) to provide exceptional speed and power. Easily reversible actuator can be changed in the field. Also available in spring return and side mounted handjack models.

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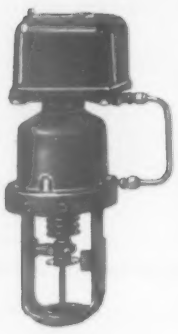

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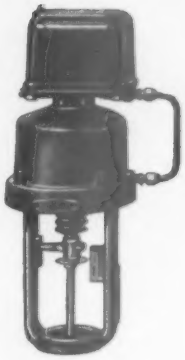

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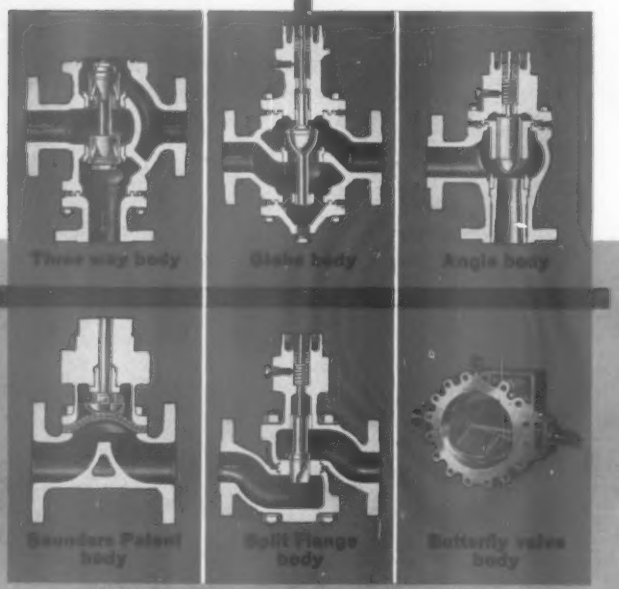

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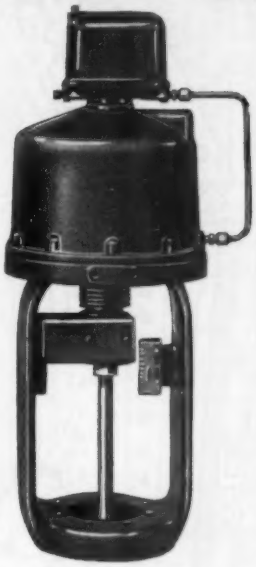

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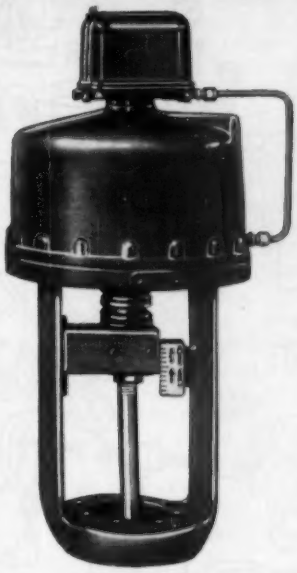
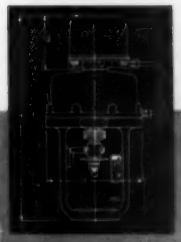


Size 100

SPECIFICATIONS

Actuator Size	Cylinder Size, Inches	Stem Size, Inches	Body Size, Inches	AVAILABLE STEM FORCE		Travel, Inches
				100 PSI Supply	150 PSI Supply	
30	4¼	⅜	½-1½	1500	—	⅜₁₆-¾
40	6⅛	½	2-4	2500	—	⅜₁₆-1½
43	4¾	½	2-4	1500	2200	⅜₁₆-1½
60	8½	¾	5-8	5000	—	⅜₁₆-2
63	4¾	¾	5-8	1500	2200	⅜₁₆-2
64	6⅛	¾	5-8	2500	3600	⅜₁₆-2
80	10¾	1	10-16	8000	—	¾-3
100	13	1¼	10-16	12000	—	¾-3

Note 1. Sizes 43, 63 and 64 may use supply pressure up to 150 psi.



Actuator Size	B Inches	C Inches
30	19¼	6¾
40	21⅝₆	8⅛
60	23⅛	10½
80	33¹¹⁄₁₆	12¾
100	33¹¹⁄₁₆	15

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SINCE 1880

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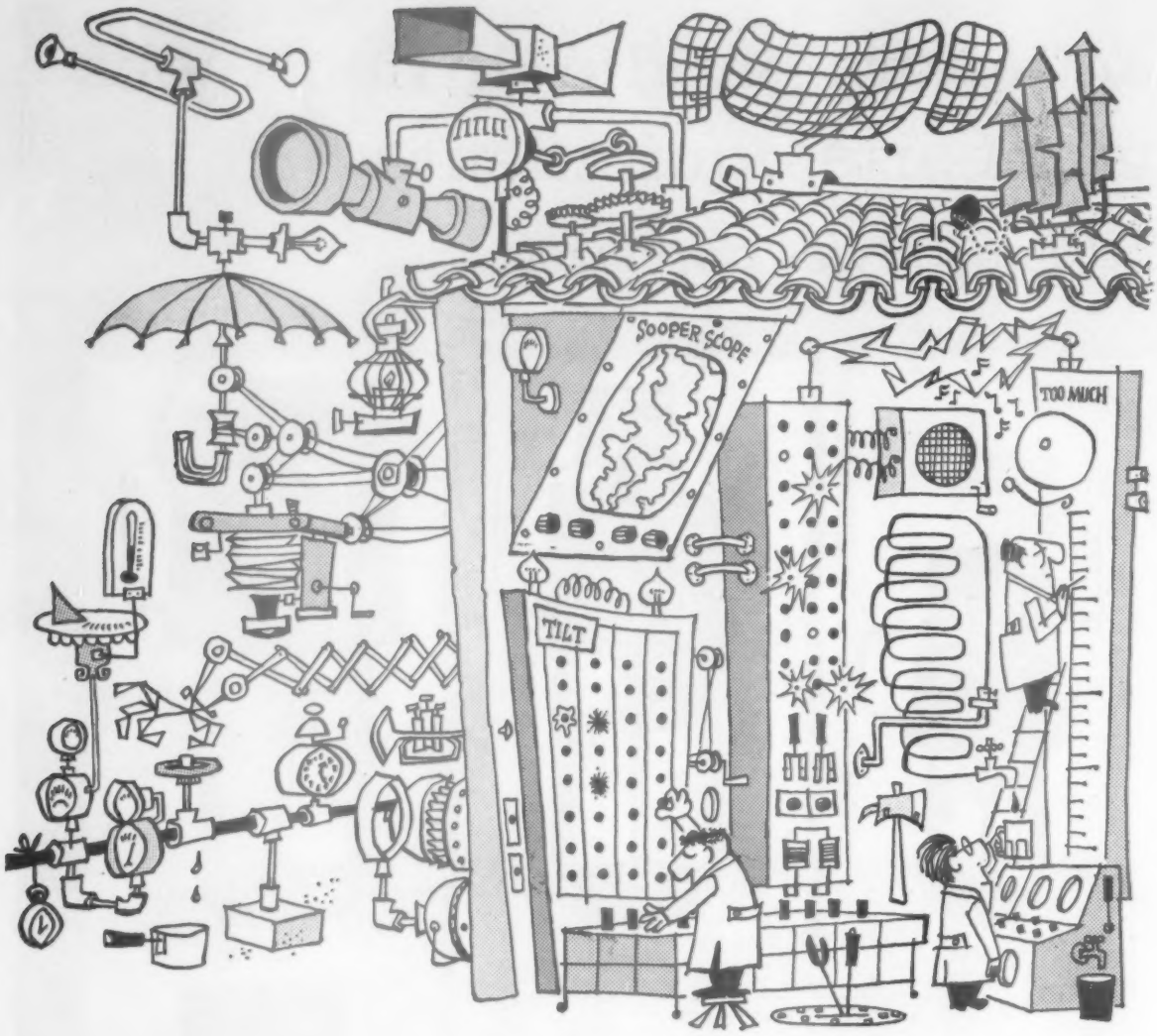

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Union Centralized Transport Control can remotely operate a single booster station or an entire system. It can provide automatic sequencing, telemetering, data handling and display, data logging, instrumentation and communications.

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They Say—

No Colorado problem

Dear Sir:

In your August 31 issue, page 40, you said, in reporting a meeting of a so-called Conservation Forum, that Colorado has real spacing problems in connection with oil and gas development, and that the Forum thinks that 10 and 20-acre spacing patterns are too easy to come by in the Denver-Julesburg basin under the present regulatory set-up, also that the Forum hopes to pattern oil-well spacing based on 40 acres and wider.

These statements are entirely wrong. I wrote my good friend, Jake Hamon, asking him to correct the same.

I am not even suggesting a retraction, but I hope some time you can make it clear that Colorado is perhaps the foremost state in the Union in relation to adequate spacing, 40 acres or more.

The Colorado Oil and Gas Conservation Commission has issued many spacing orders but none covering less than 40 acres.

Warwick M. Downing
Chairman, Colorado Oil and Gas Conservation Commission
Denver

Skilled worker in demand

"The nation and industry demand skilled people. The last few years have seen tremendous changes in products, processes, equipment and techniques. And, it seems, every change requires employes with higher skills and more education."

David H. Dawson, vice president, Du Pont Co., in an article in the September-October issue of Better Living, company magazine.

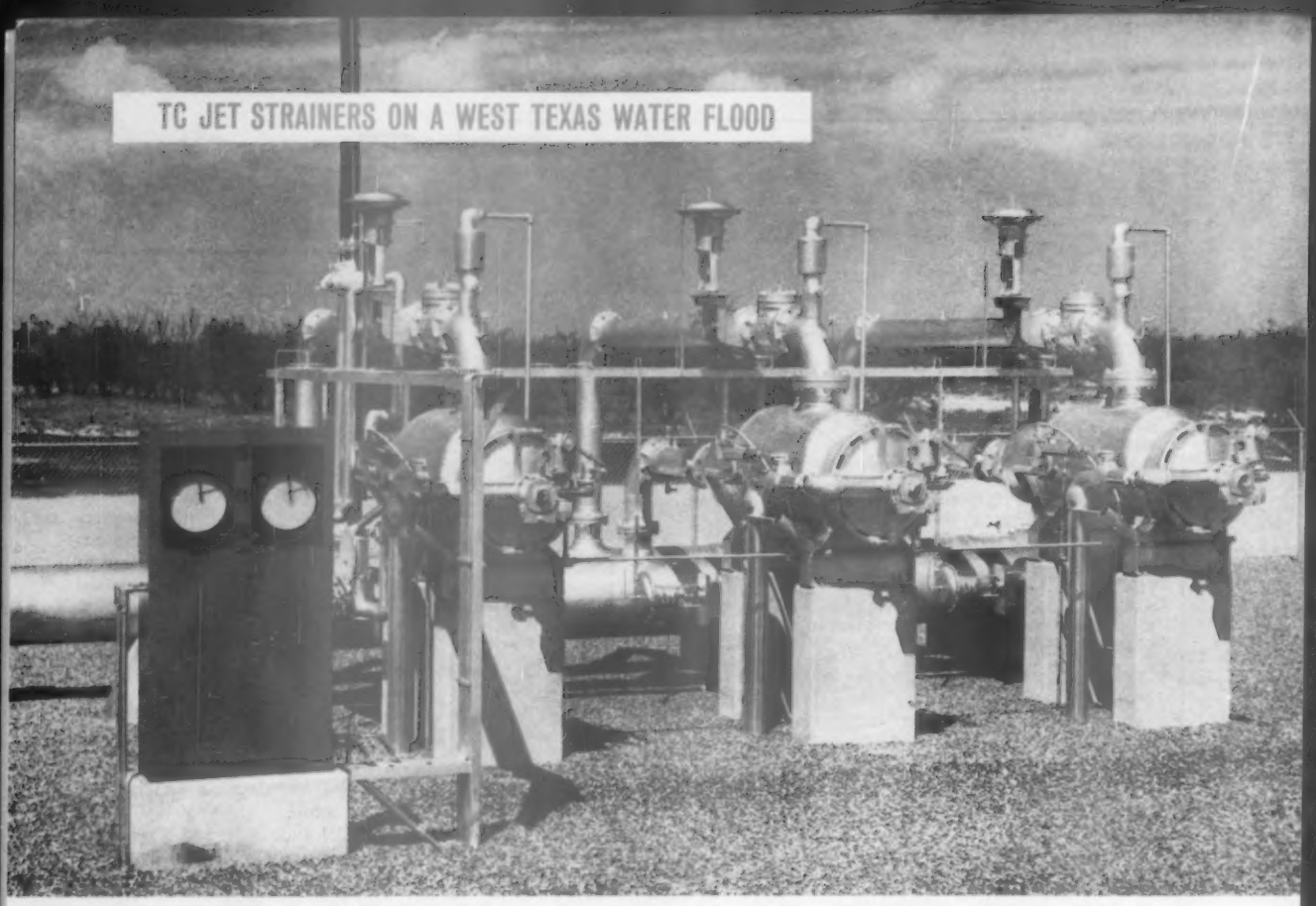
Job without a company

Dear Sir:

I wish to call attention to an error in my biography, page 186 of the September 21 issue of the Journal. It accompanied an article by me on compressor station lubrication.

The error makes it appear I started working for Panhandle Eastern Pipe Line Co. in 1925, several years before the pipeline was built.

I graduated from high school in 1925 and joined the Panhandle Eastern organization in 1931 and served successively as laborer operator, as-



The One Sure Way to Clean Up Injection Flood Water

There's a big difference in water filtration equipment. Here, for example, are three small, compact, T-C Self-Cleaning Jet Strainers with a huge capacity for handling injection flood water. But best of all, these strainers require little attention, even less maintenance expense. In fact, their operation is fully automatic. They clean themselves when the baskets become dirty. At a predetermined pressure-differential across the basket, rotating jets go into action and scour the baskets clean. The entire cleaning operation takes only a few minutes.

T-C Jet Strainers are available in 10H, 20H and 30H sizes. 100, 200, and 400 mesh screens are interchangeable, depending on the particle size of sand and solids to be removed from the water. Extremely fine filtration, down to sub-micron particle size—including algae and bacteria—can be obtained easily with the aid of a diatomaceous earth coating on the basket.

If you attach importance to the cleanliness of your flood water—and most operators do—you should know all about T-C Jet Strainers. A brochure will gladly be sent on request.

An over-all view of a water filtration installation near Odessa, Texas. The three Model 30-H, T-C Self-Cleaning Jet Strainers are shown in the close-up above and at far right in this picture.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

sistant plant superintendent, and division superintendent. In 1953 I assumed my present position as compressor department superintendent with Trunkline Gas Co.

Cecil R. Carter
Superintendent of Compressor Stations
Trunkline Gas Co.
Houston

Grass roots representative

"Since the landman historically has dealt with property rights, he should be fully aware of the insidious dangers involved in stringent governmental control and the collectivists' attempt to nationalize the American oil industry or regulate it as controlled utility or monopoly. More important, he should do something about it.

"The successful landman, by training and experience, must learn the essential ground rules as employed by politicians as a class, and in his enviable position as a 'grass roots' representative of the oil industry, opportunities are unlimited to create a more favorable business climate for the industry."

Arch H. Rowan, Fort Worth independent, in an article in The Landman, magazine of American Association of Petroleum Landmen.

True education

"This is the age of specialization, but is it the age of the specialist?

"The oil industry is one of the most technical and automated of industries. Its operations require the services of many professions, technicians, and specialists. But a closer look at this industry—or any major industry for that matter—shows that its actions and growth depend on decisions of a social and economic nature that involve much more than the routine use of the slide rule, the seismograph, or electronic computer.

"Industry has found that generally it can train an educated man for a job, but it cannot necessarily educate the trained man.

"Recently, in an opinion survey conducted by the University of Toronto, respondents were asked: 'What is the most important function of a university?' Just over 50% of nonuniversity graduates named the training of doctors, teachers, engineers, scientists, and other professions. Only 32% said that fostering creative thought and research, and independent opinion, were the main purposes of a university. The answers of university graduates were in almost reverse ratios.

"It is apparent that a majority of

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Tel-E-Lect Products, Inc. is producing a new hydraulically equipped truck with remote control pole-setting unit. Operator, standing outside of truck, controls all equipment from one simple remote control head.

The trucks are equipped with BRADEN M6-15AES Winches, and perform perfectly as an integral part of the control unit.

This is another example of the ingenious ways BRADEN Truck Winches can be used to speed and lighten complicated handling jobs.

Close up of the TEL-E-LECT Remote Control Head.

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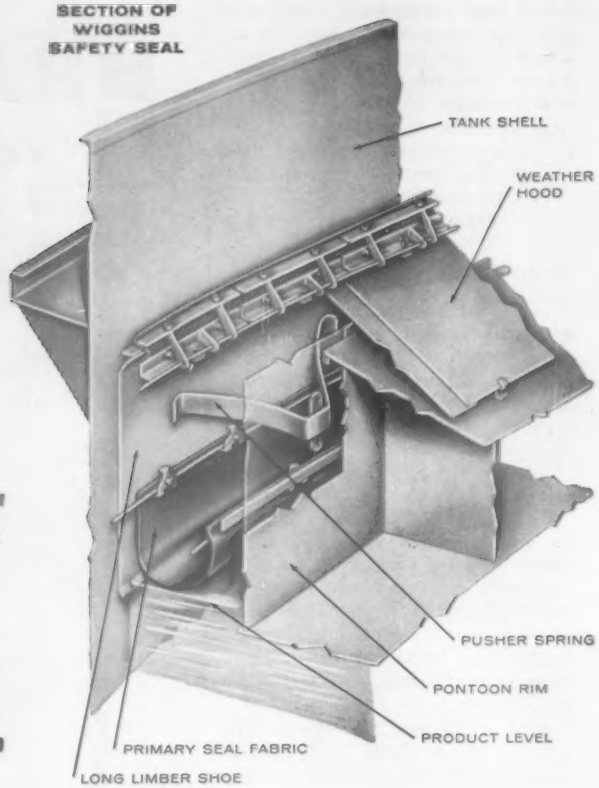

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8. No rust or scale can deposit in the seal loop.
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potential students and their parents should do more thinking about the real needs of industry and society. The successful leaders and decision-makers today—while they also may be technically trained—are those who have a broad understanding and insight into humanity and society, both past and present.

"As technical progress quickens, the problems of human relations will also increase. Future societies and industries will more than ever need leaders who can relate the demands of technology to the needs of man."

Editorial in the September issue of Imperial Oil Review, magazine of Imperial Oil Ltd.

He's not alone

"Senator Gore, chief legislative engineer of the law which set up the interstate highway program, is all fired up because the House has voted to raise the gasoline tax another penny to keep the program going.

"The Tennessee senator thinks the money should be raised in some other way.

"There isn't much question about it, gasoline is being asked to carry an inordinate tax load. Between state and federal levies, the juice that makes autos go is heading toward the same predicament as liquor and cigarets, on which the taxes are higher than the cost of making them."

Editorial in the Cincinnati, Ohio, Post and Times-Star.

Those highway funds

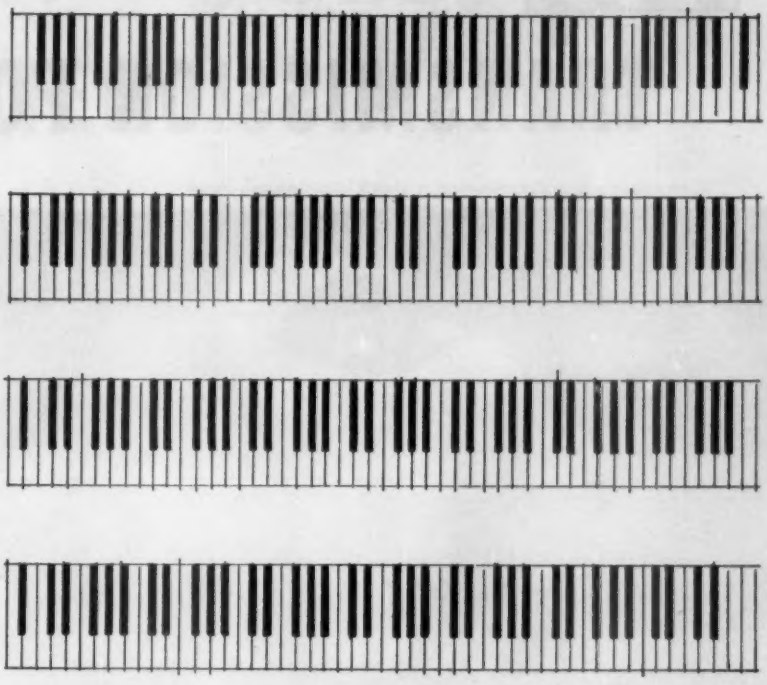
"We would like to point out that there is such a thing as over taxation and that an industry or a commodity may be taxed to the point of intolerability.

"This is presently the case with gasoline. The tax on it is heavier than on any other basic commodity. It is so heavy that it threatens to reach the point of diminishing returns for the Government and to endanger the business.

"Nobody questions the need for more and better highways for the nation, least of all the management of Gulf Oil Corp. The roads should, and must, be built. But the new tax is not necessary for this.

"We think the Government is mistaken when it says more taxes are needed to finance the $40 billion project. They are not. It has been authoritatively shown that if the proproceeds from all of the special federal taxes on motor vehicle users (taxes in effect before the recent 1 cent gasoline tax increase) were applied to the

Which piano keyboard is correct?



Can you tell the real thing when you see it?

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ANSWER: The tune will come out sour on all except the third one from the top. Try this one on your music-loving friends!

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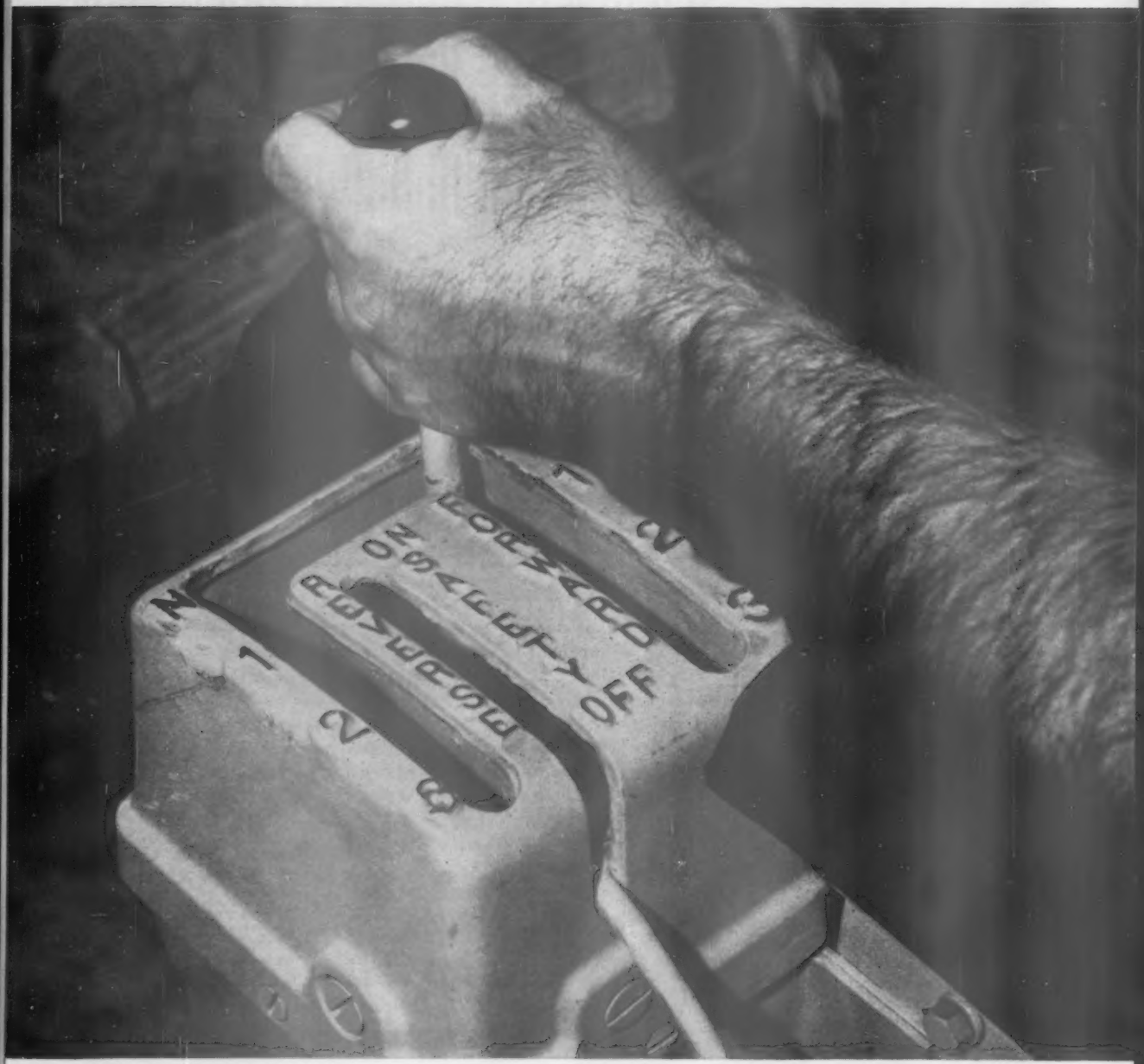
CATERPILLAR'S **No. 1** PROJECT

*PAYS OFF FOR YOU AGAIN**

NEW CAT TRANSMISSION FOR THE NO.



Power shift control is mounted to the left of the operator. One selector lever eliminates gearshift, forward-reverse and flywheel clutch levers. The safety lever prevents accidental transmission engagement. The selector lever moves in a "U" path to various positions. To the left are three reverse speeds. To the right, three forward speeds. To change speed, simply move lever to the required position. To change travel direction, move lever to the opposite side. Changing speed and direction are as easy as that—without clutching—and changes can be made while the machine is in motion under full load without loss of power or momentum.

POWER SHIFT 583 PIPELAYER

- **Shifts on-the-go under full load in a split second!**
- **Changes speed, reverses direction with one finger-tip control lever!**
- **Offers precision control of the pipelayer over the roughest ground!**

The wraps are off—it's ready. After years of research and on-the-job testing, Caterpillar now offers a revolutionary new transmission option for the No. 583 Pipelayer—power shift. This new transmission—with its exclusive design—provides production highs never before possible. Here's why:

1. It combines for the *first* time the flexibility and anti-stall features of a torque converter with the operating snap of direct drive. And because of its direct drive characteristics, it's more efficient than other power shift designs.

2. With one control lever and no clutching, it reverses direction . . . changes speed . . . smoothly . . . under full load . . . in a fraction of a second.

Talk about productivity—Cat power shift delivers in a big way. Split-second, on-the-go shifts give plenty of power in the highest gear possible. Shifting is so easy the operator just naturally gets more work out of the machine. What's more, he gets it on the toughest, most demanding jobs. This new transmission means fast, easy maneuvering in such operations as leap-frogging, plus high torque in crawling up steep hills and handling big pipe. Fast, precise control of the machine lets the pipelayer inch forward in tight quarters or leap ahead to a new position down the line.

Now . . . the No. 583 Pipelayer with either torque converter drive or the CATERPILLAR POWER SHIFT TRANSMISSION. For the complete facts on the Cat power shift see your Caterpillar Dealer. He's ready to explain in detail how it works, or to demonstrate its ruggedness . . . its ease of operation . . . its productivity. Name the date . . . he'll demonstrate.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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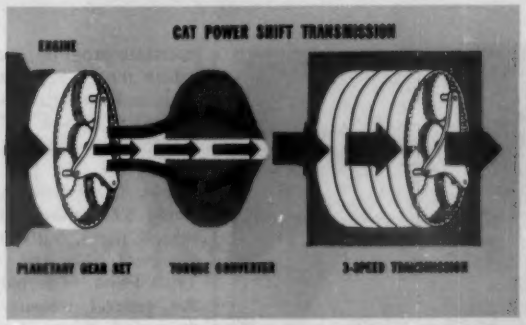
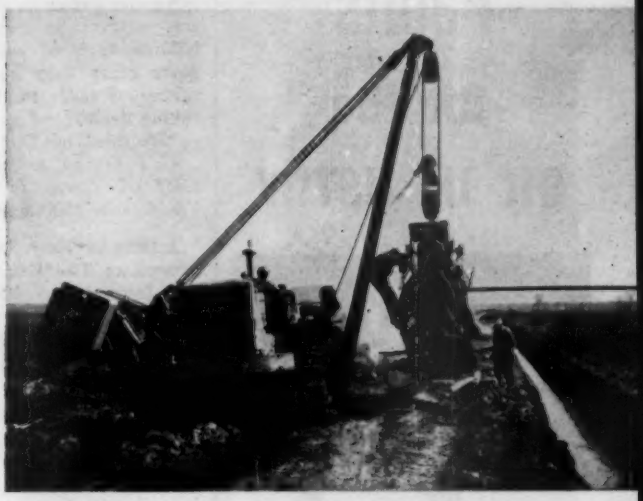
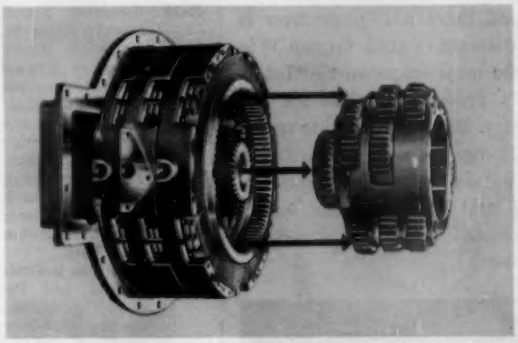
BORN OF RESEARCH
PROVED IN THE FIELD



Basic design: Total power is transmitted from the engine to a planetary gear arrangement mounted in the engine flywheel. The planetary divides and directs the total power—part goes through a direct drive shaft straight to the transmission, the remainder through a torque converter to the transmission. This enables the Cat power shift to combine the fast response of direct drive with the features of torque converter drive. Its clean, unit construction design makes it easy to service, if required.

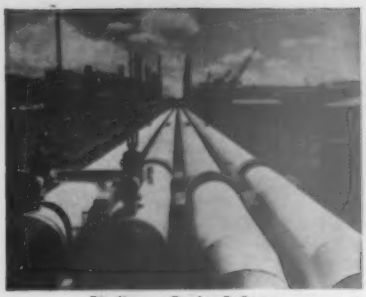


Look at these additional features on the No. 583 Pipelayer that pay off in top production . . . 235 hp • 137,000-lb. lift • 21-inch ground clearance • Lifetime lubricated rollers • Console controls • Live power winches • Double-acting counterweight



One ton of ruggedness: Here's a portion of the components that make up the new Cat power shift transmission. It weighs over a ton. Every component is designed and constructed for long-lived service. Selected alloy steel insures performance that stands up under the toughest conditions. Equally important, Cat power shift comes to you thoroughly tested by demanding field work in the heaviest duty. You can be sure that it will stay on the job.

***CATERPILLAR'S NO. 1 PROJECT:** A multimillion-dollar research program—to meet the continuing challenge of the greatest construction era in history with the most productive machines ever developed.



Pipelines at Cardon Refinery
Compania Shell de Venezuela Ltd.

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interstate program, it could be financed within the 16-year period set by Congress in the original act, even with the increased costs.

"But the proceeds have not been so applied. In fiscal 1958, for example, the federal Government collected $3.6 billion in taxes on motor vehicle users, but only $2.1 billion of this was allocated to the Highway Trust Fund. The balance vanished in the general treasury receipts to be used for things far removed from highways.

"A great deal is being said and written about the dangers of inflation. We are told that to take money from the general treasury funds and apply it to the highway program to make up the additional costs would be inflationary. Maybe so, but is this more inflationary than the diversion of highway-use taxes in the amount of $1.5 billion—42% of the total—to purposes other than highways and the raising of taxes to make up the resulting deficit?

"We think not."

C. J. Guzzo, senior vice president, Gulf Oil Corp., in an editorial in The Orange Disc, company magazine.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

OCTOBER

12-15 National Association of Corrosion Engineers, south central region conference, Cosmopolitan Hotel, Denver.

13-14 Seventh Annual Gas Measurements Institute, National Guard Armory, Liberal, Kans.

15-17 National Society of Professional Engineers, fall meeting, Penn-Sheraton Hotel, Pittsburgh.

16-17 University of Texas, E. P. Schoch lectures series, process control, University of Texas, Austin.

19-21 American Society of Civil Engineers, pipeline division meeting, Statler Hotel, Washington.

20-22 American Standards Association, national conference on standards, Sheraton-Cadillac Hotel, Detroit.

20-22 National Association of Corrosion Engineers, north central region conference, Cleveland.

20-22 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Sheraton-McAlpin Hotel, New York.

22-23 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin section, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

23 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

26-27 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-27 Independent Natural Gas Association of America, annual meeting, Westward Ho Hotel, Phoenix.

26-28 Society of Automotive Engineers,

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Your best insurance against loss of life or property wherever lease gas is used! Incoming gas is filtered **before** use. Three separate chambers within "GAS GARD" do it. As fluids build up in lower chamber, stainless steel float rises and shuts off gas until fluid is drained away manually. A size for any application.

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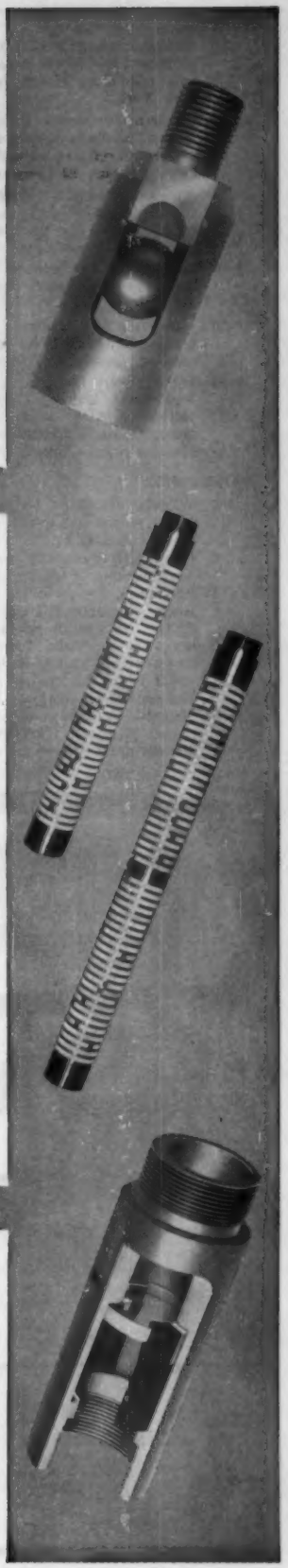

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Manufacturer

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national transportation meeting, La Salle Hotel, Chicago.

27 American Institute of Chemical Engineers, New York section, technical symposium, Hotel New Yorker, New York.

28-29 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28-29 Armour Research Foundation of Illinois Institute of Technology, annual computer applications symposium, Morrison Hotel, Chicago.

28-30 Society of Automotive Engineers, fuels and lubricants meeting, La Salle Hotel, Chicago.

28-30 American Association of Petroleum Geologists, Mid-Continent regional meeting, Broadview Hotel, Wichita.

29-30 Oil Recovery Symposium on Southwest Texas, sponsored by southwest section of AIME and Texas Petroleum Research Committee, Driscoll Hotel, Corpus Christi, Tex.

NOVEMBER

1-2 Western Petroleum Refiners Association, second computer conference, Hotel Tulsa, Tulsa.

2-4 Geological Society of America, annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pa.

4-6 Rocky Mountain Oil and Gas Association, fourteenth annual convention, Brown Palace Tower, Denver.

4-6 Institute of Radio Engineers, national automatic control conference, Sheraton Hotel, Dallas.

9-10 National Academy of Sciences-National Research Conference, first international symposium on fire research, National Academy of Sciences, Washington.

9-11 American Petroleum Institute, thirty-ninth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

9-12 Society of Exploration Geophysicists, twenty-ninth annual meeting, Biltmore Hotel, Los Angeles.

12-13 American Association of Petroleum Geologists, Society of Exploration Geophysicists, Society of Economic Paleontologists and Mineralogists, Pacific section, thirty-sixth annual joint meeting, Biltmore Hotel, Los Angeles.

16-20 Fifth International Automation Congress and Exposition, New York Trade Show building, New York.

17-18 Natural Gas Pipe Line Institute, new Seward County Courthouse, Liberal, Kans.

19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

20 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

20 Appalachian Geological Society, technical meeting, Charleston, W. Va.

22-29 Third Venezuelan Geological Congress, sponsored by Venezuelan Society of Geologists and Venezuelan Ministry of Mines and Hydrocarbons, Caracas.

29-Dec. 4 American Society of Mechanical Engineers, annual meeting, Chalfonte Haddon Hall, Atlantic City, N. J.

DECEMBER

3-5 American Chemical Society, southwest regional meeting, Baton Rouge, La.

3-5 Interstate Oil Compact Commission, annual meeting, Sheraton Hotel, Philadelphia.

6-9 American Institute of Chemical Engineers, annual meeting, Sheraton Palace Hotel, San Francisco.

11-15 Society of Automotive Engineers, meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

JANUARY

22 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 Plant Maintenance and Engineering Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-5 Instrument Society of America, instrument-automation conference and exhibit, Houston Coliseum, Houston.

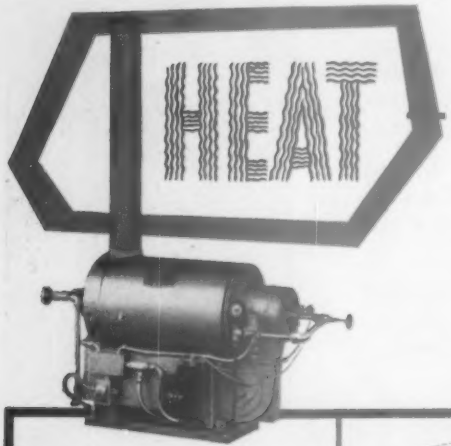
8 Alberta Division of Canadian Petroleum Association, annual meeting, Hotel Palliser, Calgary.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical Engineers, meeting, Biltmore Hotel, Atlanta.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.



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Whether you need heat in the bottom of a well or the bottom of a stock tank . . . heat to prevent paraffin or asphalt deposits in tubing and flow lines . . . to eliminate freezing of flow chokes on gas wells . . . for heater-treater installations or any other of scores of services in the oil fields, you'll get it more efficiently, economically and safely with the Texsteam BTU Thermal Unit.

This closed, forced circulation heater may be fired with natural gas, LPG or light oil, using hot water, steam, oil or a combination of water and soluble oil as the heat transfer medium. It can be furnished with electric motor or gasoline engine drive; with electric or mechanical controls. It is completely unitized and skid mounted . . . wired and test fired before shipping.

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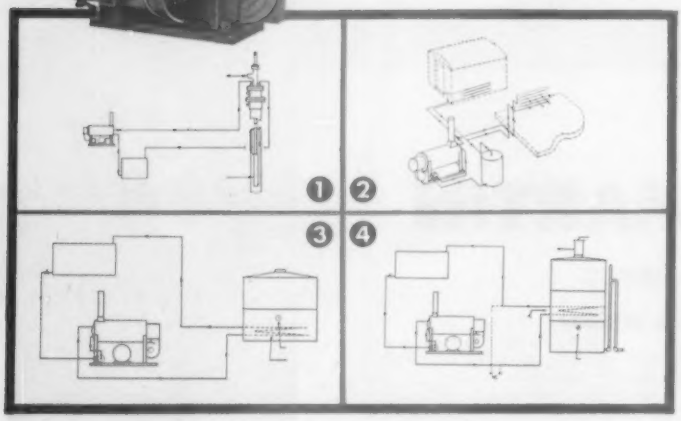

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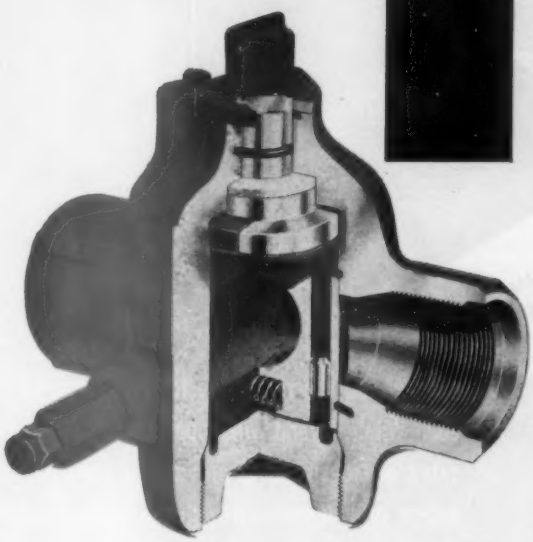

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Here's a valve that knows exactly what to do:
The higher the pressure, the more tightly the valve seals.
And it's as simple as this—line pressure forces
Mission Sealant through two semi-circular grooves around
the downstream port, sealing like a plastic packing,
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Two split cylindrical cores, acting like a gate,
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the Journal said...

50 years ago

October 6, 1909

Harry Sinclair and P. J. and Thomas White, who have just made a handsome cleanup on the sale of their Alpine Oil Co. holdings in Oklahoma, are planning the construction of a trolley line from Tulsa to Red Fork, Sapulpa, and adjacent oil fields.

Belief is gaining among Houston geologists that some of the main bodies of oil in the Gulf Coast region lie under the bed of the ocean, perhaps miles deep. Pools opened in Texas and Louisiana may become second in importance to deep oil deposits yet to be found.

News that the Sunflower refinery at Niotaze, Kans., has gone into the hands of a receiver is causing much surprise among Tulsa oil men. General belief has been that this was the most prosperous refinery in Kansas.

25 years ago

October 11, 1934

Louisiana's daily oil production climbs above 100,000 bbl. for the first time in more than 20 years. Daily average for week hits 102,605 bbl., increase of 3,280 bbl. over previous week. Louisiana ranks fourth among all states.

Carter Oil Co. enters booming Fitts oilfield play in southern Pontotoc County, Oklahoma, with purchase of 520 acres of leases from W. A. Delaney, B. C. King, and Sam S. Miller, who pioneered the field.

Texas oil industry faces complete breakdown of all rules and regulations pertaining to production, refining, transportation, and marketing as hot-oil production mounts.

10 years ago

October 13, 1949

Seven thousand visitors crowd Continental Oil Co.'s new $9,500,000 Billings, Mont., refinery at formal dedication ceremonies and open-house. Montana Governor John W. Bonner, and L. F. McCollum, Conoco president, officially open plant.

Navy department turns over control of famous Teapot Dome oil reserve in Wyoming to United States Geological Survey. Drilling of deep test proposed to explore lower geological horizons.

Shell Oil Co. becomes first in petroleum industry to own jet-equipped airplane. Plane, bought from U. S. Air Force, to be used for testing various types of fuels.

JOURNALLY SPEAKING

Mixed Motoring Emotions

A LITTLE knowledge may or may not be a dangerous thing, but a little knowledge about the oil industry nearly ruined our vacation. What we mean is, we had mixed emotions about the gasoline and highway conditions we encountered in covering some 3,000 miles by car.

As a motorist, we profited by the many local gasoline-price wars, and the girl who travels with us took a shopper's delight in watching for the lowest price postings.

If the fuel gage pointed close to "E" where no price war was in evidence, she wanted to get only a couple of gallons in hopes that there would be a local war in the next town down the road—and there usually was.

This eased our pocketbook a bit, but it pained us to see so much roadside evidence of the surplus of gasoline and the intense price competition involved in trying to get rid of it. For we knew that much of the low-priced gasoline undoubtedly was being sold at little or no profit to the dealer, the refiner, or the oil producer.

We don't see how any motorist can entertain the notion that the oil industry is just one big monopoly and that there's no competition in the business. There was obvious competition at every crossroads—excessive, wasteful competition. Almost every locality seemed to have about twice as many service stations as it needed for the business apparent.

We mulled over the speculation that the industry as a whole might be able to sell gasoline considerably cheaper at the pump if there were only about half as many filling stations to be manned and supplied. But of course any move to reduce the number of filling stations would be considered to be—and perhaps would be—suppression of competition, fostering of monopoly, and impairment of an individual's right to get into and go after business.

See what we mean by mixed emotions?

Every so often, as we drove along, we would get on a gloriously smooth stretch of four-lane, limited-access, divided highway. And just as often we sighted similar modern thoroughfares in various stages of construction but which obviously couldn't be opened to traffic for another year or two.

As a motorist we wished the authorities would bestir themselves and complete all segments of these intercity throughways and urban bypasses day after tomorrow. It seemed almost worthwhile paying gasoline taxes in order to get such highways. But when we realized what a tremendous amount of this type of construction is needed, and its cost per mile, we had grave doubts that any rate of gasoline tax will ever pay for it all.

Maybe toll roads are the answer. Somehow, we always felt we were getting our money's worth on a toll road.

Then on October 1 all filling-station operators were busy taking down their price signs and putting up new ones 1 cent higher. We knew without being told that it was the increased federal tax that was voted to keep the highway program going. But we also knew that this money wouldn't begin to finance the ambitious—and highly desired—freeway program and that more financial crises will arise if motorists like us continue to cry for more superhighways—as we will.

So then we wondered how much of the trouble might be due to political bungling and bureaucratic inefficiency, and we pondered the thought that the oil industry, which has so much at stake in both the financing and the fruits of the superhighway system, could straighten out the mess by using its business brains to develop a sounder program. There must be a better way than just boosting the gasoline tax every year or so.

But then we recalled all the gasoline-price wars and realized that behind them is the industry's inability to keep its supply in balance with demand, resulting in submarginal profits for every division. So we concluded that until the oil industry can put its own house in order and keep its gasoline dollar sound it probably couldn't do any better with the highway program than the politicians are doing.

Thinking is a very bad thing to do on a vacation.

—Henry D. Ralph.

Another successful use for BAKER Packers... parallel string installations

Baker Retainer Production Packer Product No. 415-D

FEATURES

Holds any pressure from either above or below that is safe for the casing, even under temperatures in excess of 300°F.

Pack-off is independent of set-down weight or tension. Tubing string is free; just pick up (or unlatch and pick up) to remove it.

Use it as a squeeze and testing tool or as a temporary or permanent bridge plug in conjunction with any production application.

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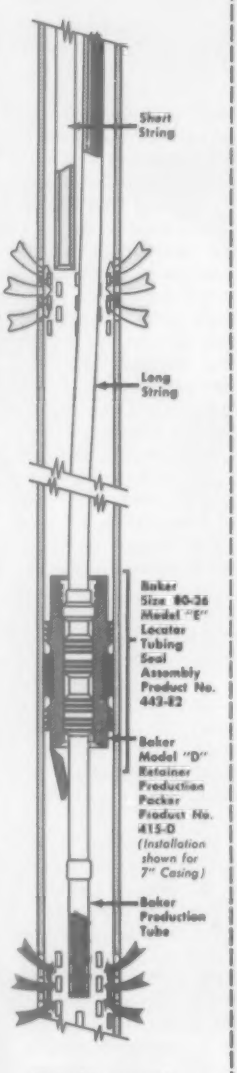
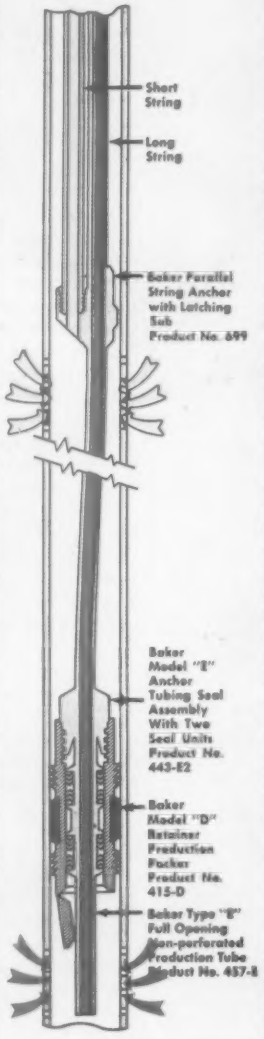
SHORT STRING HANGING FREE


Short String
Long String
Baker Size 80-36 Model "E" Locator Tubing Seal Assembly Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

Permits removal of either string independently of the other regardless of sequence. Full-Opening (Tubing I.D.) Long String to lower zone.

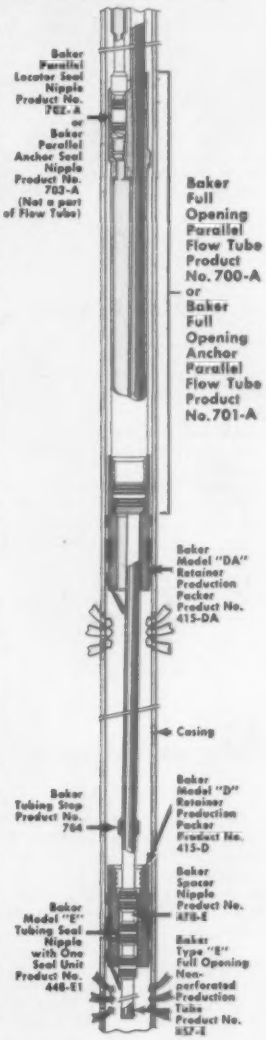
DUAL ZONE
parallel
string
SHORT STRING ANCHORED


Short String
Long String
Baker Parallel String Anchor with Latching Sub Product No. 699
Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Permits removal of either string independently of the other, however long string must be run first. Short string pulled first. Full-Opening (Tubing I.D.) Long String.

DUAL ZONE
parallel
string
TWO-PACKER HOOK-UP*

**Ask for details of "Retrievable Upper Packer" installations, and other parallel string hook-ups.*


Baker Parallel Locator Seal Nipple Product No. 702-A or Baker Parallel Anchor Seal Nipple Product No. 703-A (Not a part of Flow Tube)
Baker Full Opening Parallel Flow Tube Product No. 700-A or Baker Full Opening Anchor Parallel Flow Tube Product No. 701-A
Baker Model "DA" Retainer Production Packer Product No. 415-DA
Casing
Baker Tubing Stop Product No. 764
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Spacer Nipple Product No. 478-E
Baker Model "E" Tubing Seal Nipple with One Seal Unit Product No. 448-E1
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Illustrates Two-Packer parallel string installation with each zone confined to its individual tubing string with full-opening to lower zone for use of all permanent-type completion tools.

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Fewer drilling contractors today but maybe better ones

DRILLING CONTRACTORS, like the rest of the oil industry, have been going through a drastic and painful shaking-down process during the past year. A good many of them have been shaken out of the business completely.

A Journal survey shows that there are 169 fewer drilling contractors in business this year than last year, and that there are 385 fewer rotary rigs for hire.

Most significant, though not at all surprising, is the fact that the bulk of the disappearances—126 of the total—is among the small firms, that is, contractors owning only one or two rigs.

THIS MORTALITY RATE is sad, but not necessarily alarming. There is nothing in the statistics to suggest that the big firms are gobbling up the little ones, or that there is any trend toward economic concentration or the reduction of competition.

Rather it looks like the old story that when business is slack the smaller and weaker firms fall by the wayside. The statistics don't show it, but it is a fair presumption that most of the firms that folded were among the least able and efficient in the business. If so, the surviving drilling industry as a whole should be healthier as a result.

It has long been a complaint that it is too easy to get into the drilling business. Whenever there is a drilling boom in any area, new contractors come out of the woodwork, so to speak. They can assemble a rig from old parts or get easy credit from equipment suppliers. Too often they lack both the technical and business ability to operate properly, and bid at barely enough to meet the payments on their iron. If these are the contractors who have disappeared, there is little cause for tears.

IT WOULD BE BAD for the industry if the trend indicated a lack of opportunity to get into the drilling business. For most contractors want to become oil producers also, and many a strong independent made his entry into the industry via the drilling route.

There is still plenty of opportunity to enter the business, but today the initiation fee is higher. A successful contractor now should be both a shrewd business manager and a drilling engineer. Rigs are becoming more expensive and more intricate, technology more severe, and operators more exacting.

And there is still opportunity for the little fellow. More than half the present contractors own only one or two rigs, and they account for a fifth of all rotaries in the country.

The drilling rate is picking up, and with some weak sisters and junk rigs out of the picture, conditions should be better for those who have weathered the storm.

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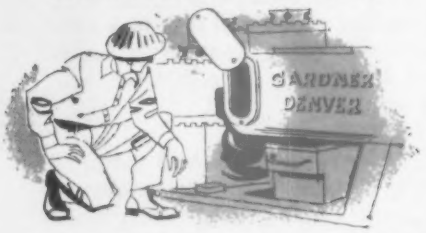

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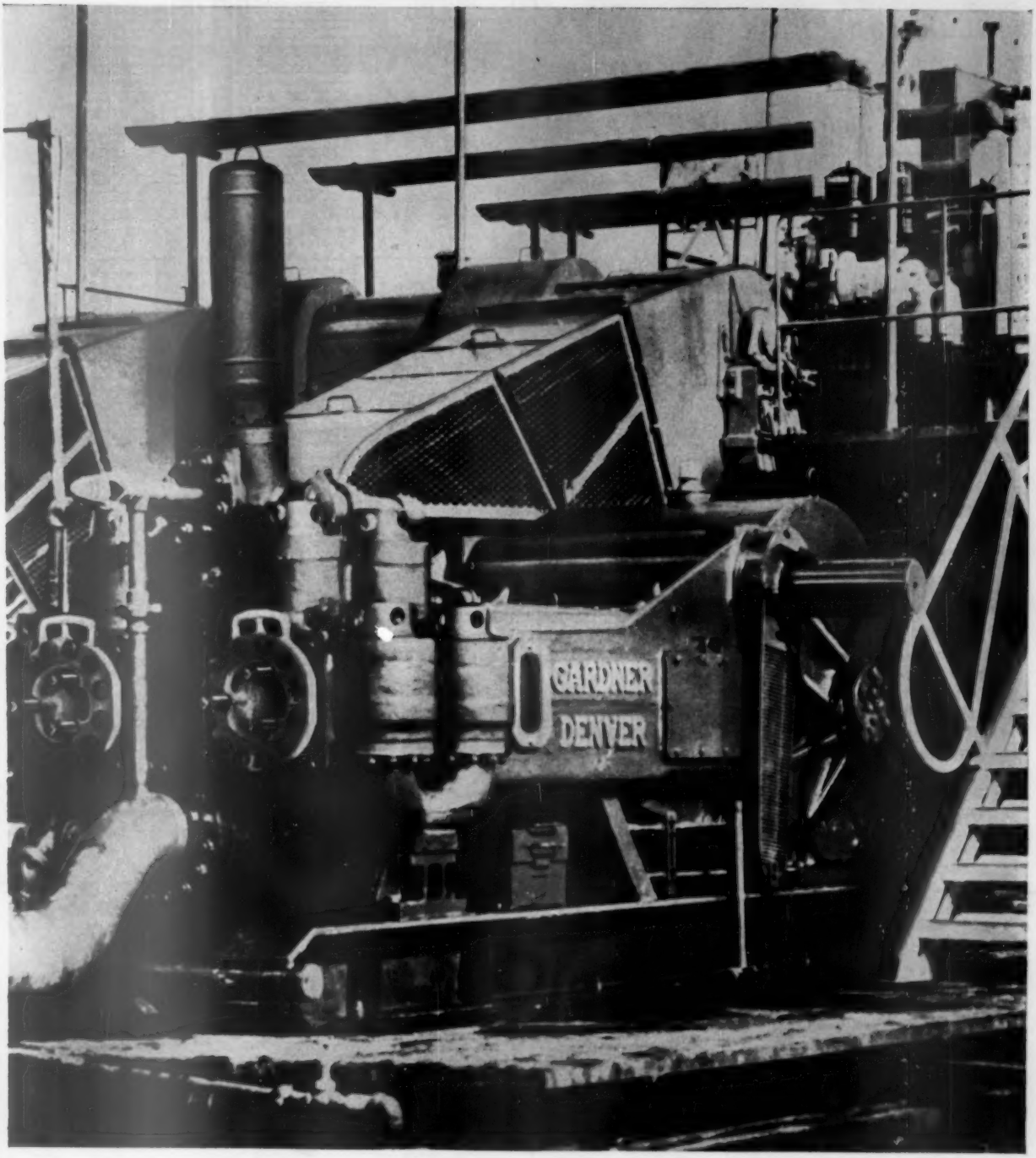

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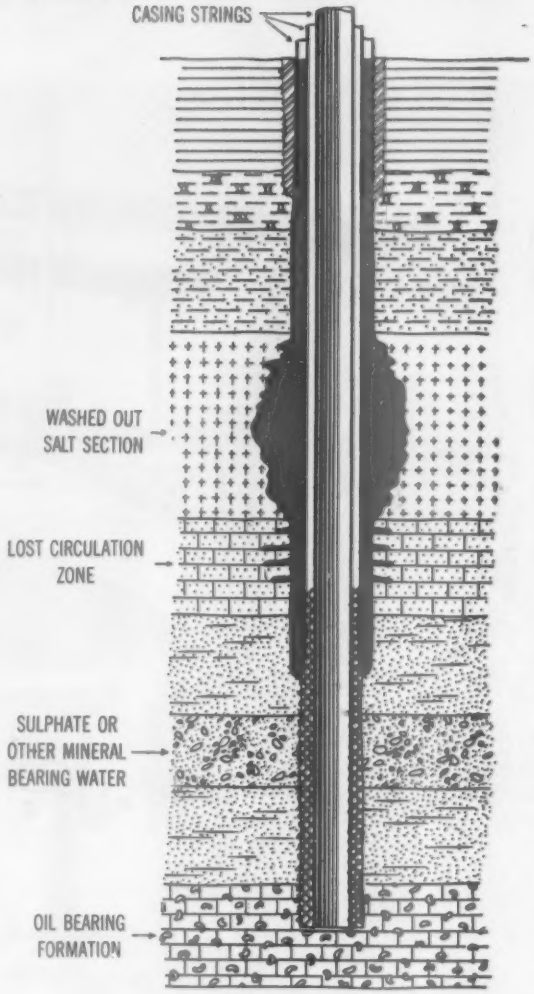

PROTECTION—under conditions typical of Permian Basin area.

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Labor Shortage Hits Drilling Contractors

- Rig hands may give many reasons for leaving their jobs, but a pay raise probably would keep most of them on the payroll.

DRILLING contractors can expect to find themselves in a real pinch for competent rig help whenever rig activity turns upward.

A growing scarcity of drillers, and especially roughnecks, already is plaguing contractors in many areas. Any substantial hike in activity would be certain to aggravate the situation.

Principal cause of the rig-labor shortages is the prolonged low level of rig activity. Crew members of stacked rigs, able in some cases to work only half the time, often have simply picked up and left.

But there are other causes, too. Pay rates for rig help have remained relatively static in the past 10 years while those for other semiskilled labor have gone up sharply. The constant moving is highly unpalatable from the family point of view. This has always been so. But the rig laborer now is inclined to find the nomad life much more objectionable since the once high differential between drilling wages and those in other industries has been eaten away.

This is the situation as drawn for the Journal over the past few weeks in interviews with drilling contractors all over the country.

Many of them are deeply concerned over the rig-labor outlook. A large number of contractors say they already are hurting for good rig hands and are forced to get along with much less competent personnel.

Some are pinched for good help in some areas while not yet troubled in others. Others are operating too few rigs to feel the pinch now but expect it later when more of their rigs go back to work. Only a smattering of those interviewed think the contractor has no more than the normal labor problems.

Though most contractors are worried, few are able to see any effective measures they can take at present to improve the situation. And many expect it to get worse.

Economic evolution? . . . Some contractors feel that their difficulties in hiring and keeping good men are due to something of an economic evolution during the past 10 years—a basic difference in the way people live.

Few men find it necessary now to sacrifice normal family life in order to live.

Chris Zeppa, vice president of big Delta Drilling Co., Tyler, Tex., believes that this is a large factor in the lack of rig labor.

"Men who used to follow a rig wherever it went, living in boarding houses in communities nearest the location, now are building their own homes. Their families want them home. And they either work on rigs within a 100-mile radius of their homes or they quit to take other jobs outside the industry. Industrial jobs are opening fast in the South now, where 10 years ago there were hardly any factories here."

Another facet of this economic evolution, Zeppa says, is that contractors' labor standards have gone up through the years. Drilling machinery and techniques have advanced sharply while labor development has not kept pace. "Thus a driller that we considered good 10 years ago doesn't measure up now."

Delta has found good rig help extremely scarce in the Rocky Mountains and in the Delaware and Val Verde basin areas of West Texas. It has had little trouble as yet in such areas as East Texas and South Louisiana "where there are many towns, activity fairly steady, and a man doesn't need to move to work."

C. B. Webster of Webster Drilling Co., Houston, agrees with Zeppa that times have changed.

"When I started out as a roughneck, I couldn't make half as much money doing anything else. Now a man can

Loffland's T. W. Wheeler
. . . "we tried granting mileage allowances."

stay home and work 40 hours a week, perhaps do something else on the side, and make as much money as he could working on a rig."

The problem, Webster thinks, has been coming on for years, "even as far back as the comparatively good times of 1956 and 1957."

Defense jobs a lure . . . Many contractors complain of losing good men to defense industry because of the frequent and sometimes lengthy slack periods between wells.

J. L. Stauss, executive vice president of Falcon Seaboard Drilling Co., Tulsa, thinks this exodus of men to other industries has not happened just during the past few months or even during the past couple of years.

It is a long-term development, Stauss contends, that has been growing steadily and becoming more acute especially during the last 4 to 5 years.

Many former rig hands in the Mid-Continent and West Coast areas, at least, are now working in defense industries, Stauss says.

"Friends in the personnel departments at Tinker Field, Oklahoma City, and Douglas Aircraft Co., Tulsa, tell me they have quite a few former roughnecks on their payrolls."

West Coast contractors confirm the loss of rig labor to defense plants.

Joe Kellogg, assistant general manager for K. L. Kellogg & Sons, Compton, Calif., says his firm noticed the personnel shortage beginning to pinch about 6 months ago. "Shortages show up here whenever rig activity gets above the normal level—which has been running at around 50 to 60% of available rigs."

"The men just don't go for the 30 days on and then maybe 60 days between jobs. With construction activity so high here, they can get steady jobs somewhere else."

A spokesman for Haney & Williams Drilling Co., Long Beach, told the Journal that "we get an average of four to five applications for jobs every week from drilling personnel coming out here from the Mid-Continent. They complain that business is so lousy back there that they can't get steady work."

Haney & Williams has clear proof that many of these men have left the rig floor in favor of less uncertain means of making a living.

The company has faithfully kept a register of names and phone numbers of the immigrant rig workers. Recently, a rush job caught it short of roughnecks to fill a crew. The "tool pusher on the rig went to the register, called virtually every name in it, and still wasn't able to fill out the crew. All the recent applicants had found work elsewhere—mostly in other trades."

"We finally had to turn to the California Employment Bureau for help. This was an unheard-of step. We've always been able to round up roughnecks in the past."

Money, the big problem . . . Most contractors agree that long hours and continual family moves, though perhaps repugnant to the rig worker, are not the primary reasons for help shortages.

The big villain, coupled with the lack of work, appears to be low pay.

Webster Drilling's experience verifies this. "Long hours isn't the issue," Webster says. "It's money. Our personnel turnover is much less on rigs where the men are on duty 12 hours and off 24 than on others where they work only 8 hours a day."

Falcon-Seaboard J. L. Stauss
. . . his rig hands are going to defense plants.

Big Chief's Jack Abernathy
. . . "there are no pat answers."

Falcon Seaboard's Stauss says "It used to be that a roughnecking job paid about four times better than any other kind of unskilled work. That isn't true any more."

W. H. Smith, president of Big 6 Drilling Co., Houston, says "We're squeezed by low prices and can't pay the wages we'd like to pay in order to get the labor quality we need. We gave a raise a few months back but were already low when the last pay increase went round the industry the first of the year."

A check by the Journal into hourly wages paid drillers and floormen in California as against those paid semi-skilled tradesmen shows rig-labor wages indeed suffer in a comparison.

The average pay scale in California finds a driller getting $3.99 an hour, a floorman $2.84.

On the other hand, an electrician in the building trades takes down $4.40 an hour. A bricklayer gets $4.00. A boilermaker or blacksmith makes $4.40. A lather gets $4.20, a plumber or steamfitter $4.08, and a plasterer $4.12.

Along with the higher wages, the work is steady, the jobs are close to home, and fringe benefits are good.

What to do? . . . Contractors generally feel that there is little they can do under current circumstances to stop the shrinkage of their manpower pool.

Some feel that more and better training programs might help some. Or perhaps that the four-crew, 6-day week now used by some contractors in California would slow the drain.

But these, they think, are only par-

tial answers at best. And they would not alleviate the prime problem—the too-low wages.

Jack Abernathy, Big Chief Drilling Co., Oklahoma City, says: "Actually, I think there are no pat answers. Personnel has strayed away and it will take quite a while to get it back."

The men will come back, he feels. But it will be a gradual process. And it won't come about until the recovery in the fortunes of the drilling business takes on a fair semblance of permanence.

Eventually, nearly every contractor interviewed came back to the same point—money. A Houston contractor said, frankly, that to really improve the situation "we'd have to give a really substantial raise—not the 10 to 15 cents an hour we've given in the past."

There has been some discussion in the industry between contractor and oil-company officials of a big general raise in rig-labor pay. A few oil companies reportedly have said they would go along with such a raise if it were general over the industry. But odds against such a boost any time in the immediate future appear very great.

Though contractors lament the lack of quality of men they hire—especially roughnecks—they don't think training programs alone can either hold or attract men without the added attraction of high wages.

A Gulf Coast contractor is resigned to doing what he can with "the most untrained labor we've ever had."

"Our bid structure," he says, "simply doesn't permit us to pay any more.

"I think our people need training as badly as I've ever known. We can't assume today when we hire a roughneck that he knows anything about a rig. The tool pushers and drillers have to tell them over and over about points of operation and safety. We've done a lot toward making training available for our men. But we still have a long way to go."

Playing for time . . . With no concrete answer to existing or threatening labor shortages, contractors generally are playing for time and using any means at their disposal to hold on to key men—usually tool pushers, mechanics, and drillers.

One Mid-Continent contractor says he is finding work for his key men in the yards or warehouses, painting equipment or anything else to help them tide over idle periods and keep them on call.

Another, Loffland Brothers Co., Tulsa, is trying, without changing the wage picture, to help its men a little more to stick around for the day the going gets better.

T. W. Wheeler, Loffland vice president, says "we've tried granting mileage allowances and been a little more liberal with extras" to keep its men in the labor-short Rocky Mountains.

"We're thinking that activity should pick up during the last quarter, but it hasn't shown such signs yet."

Ironically, any big pickup in activity would almost certainly aggravate the labor shortage—at least for a time.

A good many contractors, who say they aren't hurting yet, confess that this is so only because they have been able to operate only a few of their rigs. In the event they are able to put many more rigs back in operation, they expect trouble.

Oil Does Better Than Paint as a Bridge Spray

JERSEY CENTRAL Railroad has cut the cost of spraying bridges about 75% by using oil instead of paint.

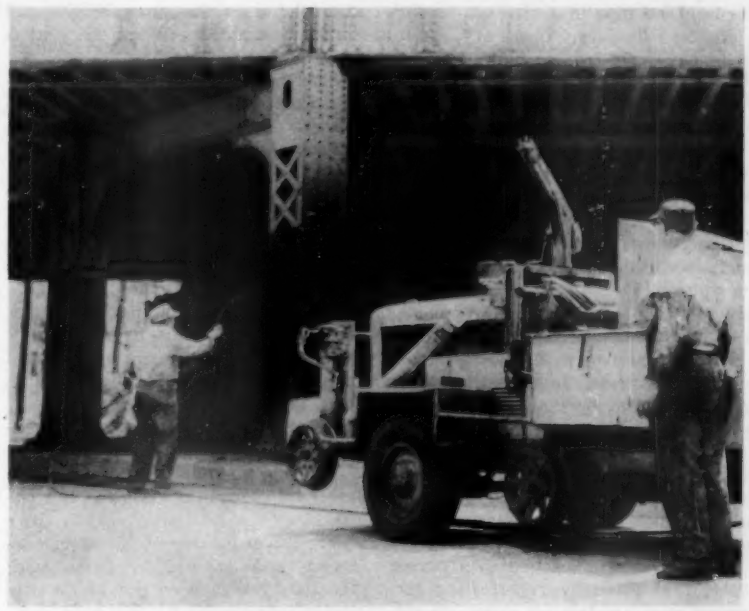
The railroad sprayed the Madison Avenue bridge in Elizabeth, N. J., in 10 days at a cost of $1,000. Painting the 100-ft. structure, which carries five lines, would have taken 24 days and cost $4,000.

Spraying with oil instead of paint is now standard for the Jersey Central. Back in 1943-46 a large number of bridges were given two coats of paint while others were cleaned and sprayed with oil. The oil stood up as well as the paint. With the oil costing 21 cents per gallon to about $2.85 for paint, the savings are enormous.

Other factors also help reduce costs: Less manpower (four-man crews instead of eight), one-coat application instead of two, virtual elimination of scaffolding, and less time and effort needed for preparing surface areas.

Jersey Central is using Texaco No. 55 which Texaco describes as a cutback asphalt metal preservative. The railroad says it dries to a hard, black, mirror-like finish and one coat does the job of two coats of graphite paint used formerly.

Jersey Central uses two Patton B. & B. sprayers, each costing $12,000. These heat the oil to about 100° F. and "atomize" it as it is applied. These sprayers are portable and can run on rails (up to 25 m.p.h.) or on highways as trailers. They have extension arms which swing a working platform over the sides of a bridge and have a 1-ton hoist to lift and handle drums of oil.



ONLY TWO MEN are needed to spray oil on a Jersey Central bridge.

Since the oil goes on "heavy," the surface does not need as much preparation as for paint. A wire brush or scraper is attached to a long pipe which is coupled to an air line from the machine. Thus the cleaner stands on the ground for most of the scraping process.

Oil Rides Out Steel Strike Smoothly

• The industry's steel supply is dwindling fast, but oil men aren't worrying too much. Low allowables are holding down drilling more than any lack of steel. The majors will be comfortable for the rest of the year and the independents should be able to hold out for another month or 45 days.

SHORTAGES of some steel items are developing in the oil industry after nearly 3 months of the steel strike.

There's still no real pinch, however. The strike will have to drag on another month or longer before that happens. In fact, most supply men predict the worst shortages likely will occur in the time lag between any strike settlement and return to full production.

That is the situation found last week when the Journal made another survey of the steel-supply situation.

Shortages center in these areas:

. . . **Small-diameter** casing and tubing—4½ to 5½-in.—are fast becoming a collector's item.

. . . **High-strength, heavy-wall** casing and tubing, used for the deep wells, are going out of supply-house stocks.

. . . **Line pipe** in 2, 3, and 4-in. diameters—the type operators use to connect wells to lease tanks and in a variety of other production tasks—is becoming exceptionally tight.

. . . **Steel sheets** of high strength and extra thickness for high-pressure vessels are practically gone from fabricators' stocks.

Supply-house blues . . . All supply salesmen admit their steel position naturally is getting progressively worse.

One commented his warehouse has "that picked-over look." Many bread-and-butter items are either scarce or gone while the slow-moving items remain.

This has resulted in many operators substituting sizes and quality not often used for the popular goods. Often it's more expensive, but at least it's one way to avoid a shutdown.

Supply companies tied to a parent steel mill generally report their terminal stocks of tubular goods are getting low. So far they have managed to take care of needs of their regular customers. Some expect their supplies to last another 30 days.

Some independent suppliers have managed to get tubular goods from steel makers not on strike. One of the largest such mill is Lone Star Steel Co. in Texas which specializes in oil-country goods. This steel has proved a lifesaver in many instances and has allowed suppliers to have some kind of steel for their customers even if it wasn't in the desired sizes or grades.

On the brighter side, all suppliers report few signs of shortage yet in equipment such as pumps, motors, sucker rods, bits, and tanks or vessels of standard sizes. They predict, however, that sucker rods will become the next scarce item and that replacements for their present stocks of equipment items may come harder.

Opinions . . . One fact has struck supply people: There's no real excitement among oil men about possible shortages.

Suppliers report oil-company managers apparently feel they'll drill the "must" wells and then as many of the others on the program as steel stocks will permit. When the steel is gone, they'll quit drilling.

There's no frantic steel buying. Foreign steel is moving into the oil country in surprisingly small volumes. What does come in is used mostly in the coastal areas.

Also—it's hard to believe—but salesmen for one steel maker not on strike say they actually are having trouble selling tubular goods to some of the major oil companies. The salesmen have found that the companies still have inventories to cover their compulsory activities and have placed orders for steel when the strike is over. They figure to last out the emergency without going outside their regular supply channels.

Talks with purchasing agents for the larger oil companies bear out this situation.

The buyer for one of the larger producing and exploration firms said: "To date, we've been put to no particular inconvenience. We have postponed drilling one well, but it called for an unusual casing job."

Another reported: "We are a little tight now on 4½ and 5½-in. but nothing bad enough to hamper our drilling program. We can go along at a normal pace for another 30 to 45 days and then we'll begin to scratch for it. There's plenty of foreign pipe coming in; but as far as I can learn, no one is buying it. As far as I'm personally concerned, I hope they choke on it."

On the imported-steel question, one buyer said, "Foreign pipe people aren't looking too hard for markets here now, I think. They have bigger and better markets in other parts of the world and they have sales reaching beyond the first quarter of next year already committed."

A drilling-production chief for a major producing company declared: "We have had and still have a fairly adequate stock. Spot shortages of bread-and-butter steel sizes have been avoided by swaps and trades. We haven't cut our drilling program."

Buyer for one integrated company was even more optimistic: "We were fairly well protected when this thing came on, and we haven't felt any pinch yet. It will be into next year, I think, before any of us will really run out of slack."

The reasons . . . Oil people attribute their industry's rather comfortable steel position to several factors:

. . . **Heavy first-half buying** of steel.

Nearly every major company went into the strike period with high inventories of steel. Their purchasing agents generally had ordered enough steel to cover this year's drilling program and had placed orders for fourth quarter deliveries this year and first quarter next. When the mill starts up again, these orders will be among the first out.

Supply houses likewise had heavily stocked their barge terminals and warehouses. They entered the strike hoping to last at least 3 months without trouble, and they have succeeded.

. . . **Swaps, trades,** and shifting of supplies.

Nearly every big and small operator has had to swap around for some of the hard-to-get items. This is adding to the cost of drilling and production, but it's one way of making all the available steel go around.

Supply people are cooperating in this also. One pipe salesman reported he found some pipe in North Da-

kota of the size an operator in the Southwest wanted. He got it shipped even though extra freight made the stuff very expensive.

. . . **Some key mills** are able to produce.

Many supply men as well as company purchasing agents report that the policy of Lone Star mill in Texas in turning out critical sizes of tubular goods has been a major factor in keeping drilling going so smoothly in the Mid-Continent. Kaiser Steel on the West Coast also has supplied some oil-country goods.

. . . **Unfavorable economics** for drilling.

Many drilling contractors say lack of steel is not the reason why drilling is down. Sloppy world oil markets which have led to proration and other restrictions on production discourage more drilling than threat of a steel shortage.

One drilling executive commented: "Steel isn't causing anyone to look at drilling pessimistically, but the oil market may be."

Another said the steel trouble has been only a psychological blow to drilling. The real trouble lies in tight production and tight money.

What's ahead . . . Oil men believe the real trouble will come in the first or second quarter next year.

Most agree the industry can finish the year in fair shape by cooperating, swapping, trading, switching, making-do, etc.

But if the strike doesn't end soon, oil-industry steel stocks will be cleaned out. Mills could take as long as 2 to 3 months before finished items start moving in any volume to customers. If the strike lasts into the winter, lake freezeups will keep ore from moving to the mills and delay production even longer.

There's an indication that when steel mills are going again, the oil industry still will not engage in frantic buying. One drilling official said his company policy would be "solve the emergencies as they arise. We won't go hog wild in building up inventories just because we can get it."

Drilling contractors themselves are cautious about predicting the future. The executive of one well-known firm commented: "We work pretty close with companies and I'm sure that there hasn't been any lowering of sights on drilling programs yet because of the strike. How long this can go on no one knows."

watching WASHINGTON

Clyde La Motte

• Washington is a busy place again . . .

WASHINGTON is shaking off its summer doldrums, and the tempo of activity is beginning to quicken.

A new look is being given a wide variety of oil issues and problems. Some of the more important are these:

. . . **Offshore boundary.** The U. S. Supreme Court will hear oral arguments, beginning today, on whether the state or the federal Government owns offshore areas beyond the 3-mile limit (p. 102).

. . . **U. S. flag tankers.** A proposal that at least 50% of oil imports be brought in by U. S. flag tankers has been made by the Joint Committee for American Flag Tankers. The Office of Civil and Defense Mobilization is studying the request to determine whether national security is involved. Other government agencies are being asked their views.

The pitch of the tanker group is this: If there is justification—on national defense grounds—for an oil import control program, there is justification for a control program on the ships used to haul the oil.

Major importers are aroused. With their imports already reduced, they want to ward off the added blow of higher shipping costs which they feel such action would bring.

It is likely to become a stormy issue before it is settled.

. . . **Marketing investigation.** Rep. James Roosevelt (D.-Calif.) is about to make up his mind on whether to resume a subcommittee probe of oil marketing practices. Watch for a tipoff in a speech he is making October 13 to the Indiana Independent Petroleum Association at Indianapolis.

You will recall that Roosevelt had such a probe in full swing 2 years ago, with public hearings at Denver, Los Angeles, and Chicago. Then the hearings were suddenly ended. Now they may be resumed.

. . . **Merger reporting.** The Securities and Exchange Commission is weighing industry reaction to its proposed rule which would require companies to report to it when they reach an agreement to merge.

Because such information would be made public, the SEC has received strong protests that premature disclosure of tentative merger plans would be unfair and would unduly hurt the companies involved.

Facing such squawks, the SEC may drop the proposal.

. . . **Import plan revisions.** The Oil Import Administration is beginning to shape up the import control program for the first half of 1960.

Some changes may be made. For one thing, room may be made for newcomers to import residual fuel, particularly those importers with large terminals. Too, further attention will be given to finding some way to make room for importers of other oil products.

Final decisions may be delayed until near the end of the current 6-month period to give OIA time to see how the present program fares during the winter months.

. . . **Gasoline tax payments.** Legislation increasing the federal gasoline tax from 3c to 4c a gal. also included the provision that jobbers could choose to pay the tax directly to the Government on a monthly basis as they sell the gasoline, rather than paying the tax to the supplier when they purchase it.

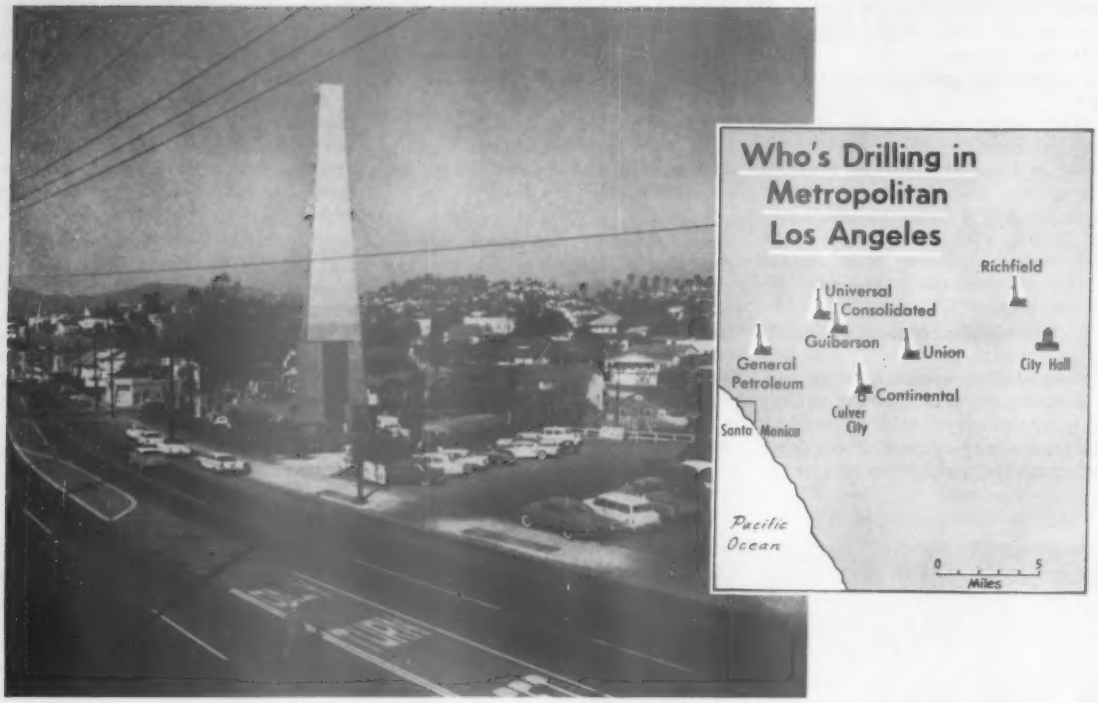
The Internal Revenue Service is working out procedures for the new collecting method, which will go into effect January 1. Proposed rules will be published shortly.

Jobber groups had pressed for the tax charge because of the money they constantly have had tied up in taxes under the old system. Also, they have been losing tax money on gasoline lost by spillage and by evaporation while in storage.

For the jobber, especially the smaller ones, the advantages may be partially offset by the added bookkeeping and tax reporting requirements. For the supplier, the change will ease his collecting and reporting burden.

But while there appear to be advantages for both the jobbers and the suppliers, there are none for the tax collectors. Now, instead of keeping track of only a relatively few suppliers, IRS will have to process, supervise, and police the thousands of jobber accounts.

However, tax collectors don't usually get much sympathy anyhow.



LA Oil Hunters Ignore Pitfalls

• The oil play in the Los Angeles area is loaded with obstacles, headaches, and dry holes—but that hasn't slowed down the operators. Several new projects are being undertaken.

OIL SEARCHERS still are eyeing residential areas in the Los Angeles Basin, despite a mounting toll of dry holes.

Just recently, a number of interesting leases were put together and approved for drilling by the Los Angeles City Council.

These projects are under way or about to start:

... Brentwood Country Club. This fashionable country club on the Los Angeles-Santa Monica border is under lease to General Petroleum Corp. The operator plans to start a wildcat on the 149-acre drilling district—which includes the golf course—before the end of the month.

This is strictly "high-rent" residential country. Several movie notables voiced objections to the project at the hearing conducted by the city before the drilling permit was granted General Petroleum.

... Culver City. Continental Oil Co. is running casing in a 9,636-ft. wildcat on the Metro-Goldwyn-Mayer film lot in suburban Culver City, just west of metropolitan Los Angeles. Continental has an 800-acre drilling district in this area which includes the Desilu TV lot, as well as the MGM property.

... Los Angeles proper. Union Oil Co. of California won approval for 10 drilling districts totaling 1,538 acres in residential portions of southwest metropolitan Los Angeles.

Putting this play together required signatures of more than 6,000 individual property owners. Union hopes to start drilling by the first of November. The same elaborate rig setup used to drill a similar test earlier this year will be used (OGJ, Feb. 9, p. 68).

... Beverly Hills. Allen Guiberson, operator, was getting ready to offset Universal Consolidated Oil Co.'s highly productive 20th Century Fox lease with a test immediately east of the film lot. The Guiberson well, 1 Beverly Hills High School, will be drilled adjoining one of the last two original wells in the old Beverly Hills oil field.

... West Los Angeles. Universal Consolidated added to its holdings in the area of its 20th Century production with a 119-acre drilling district just west of the lot. This drilling district acreage is mostly in medium-priced residential property.

In addition to those listed, Standard Oil Co. of California, Western Gulf Oil Corp., and Humble Oil & Refining Co. either have drilled or are planning to drill in town-lot areas of metropolitan Los Angeles.

Attraction vs. hazard . . . A statistical glance at the 1,800-sq.-mile Los Angeles basin clearly points up both the attraction and hazard to drillers.

For instance:

... The Los Angeles Basin has produced 42% of the state's total oil production. But on the other hand, it

contains 44% of the state's population. It holds an estimated 30% of the state's proved reserves. Translating that into barrels and people shows: The basin has produced 4.75 billion barrels of oil, now has a population of 6.5 million residents, and has 1.1 billion barrels of proved reserves.

So the oil is there to attract the driller, but the people are also there to complicate the driller's life.

One major headache facing a prospective Los Angeles basin driller is the existence of 81 incorporated towns and cities in the Los Angeles and Orange County limits of the basin. Each has its own idea of how an oil development should be carried out.

Frequently, an operator is confronted with a situation where the play he is putting together overlaps several town boundaries with different oil laws. In general, one of these three conditions exists in the towns:

... **An absolute prohibition** against drilling.

... **Drilling conditions** set forth in a comprehensive code.

... **Cities without** any oil rules.

Some of the end results of town-lot drilling can be both comic and sad, depending on how close you are to the picture. For instance:

A couple years ago a company made a small discovery in a residential area of metropolitan Los Angeles. The property is currently making around 20 bbl. daily. Under terms of the leases with more than a thousand property owners involved, the operator could wait until each royalty owner had $25 on the books before the royalties would be distributed.

However, at the rate the property is producing, the company decided to go ahead and distribute the more than 1,000 checks every month, each for just a few pennies. It would take a short lifetime for the $25 due each to accrue.

Success elusive . . . The 4-year-old oil play in residential Los Angeles has resulted in some significant failures, including the 8,045-ft. Richfield Silverlake dry hole. Union Oil, Standard of California, Western Gulf, Humble, and others have struck out in town-lot wildcats.

However, the successes, such as Universal Consolidated's production at the 20th Century Fox movie lot in West Los Angeles, keeps 'em coming back for more.

Case History . . . The experience of Richfield Oil Corp. on a town-lot play earlier this year offers a case history of this type of operation.

Richfield put together a 1,200-acre parcel on the northwest fringe of downtown Los Angeles. The area, called the Silverlake district, adjoins the old Los Angeles oil field which was discovered around the turn of the century.

Leasing was started in November 1956 and the whole thing quit-claimed in June 1959. In that time, 4,000 leases were signed up, consisting mainly of low and medium-income residential property. The lots ranged in the 40 to 60-ft. front category. A typical deal involved a rental of around $20 a year to the average lot owner with a ⅛th royalty.

During the peak leasing period, Richfield had around 45 landmen in the field. The necessary 51% of the property required for establishing a drilling district was signed up within 3 months. Since that time, a new city ordinance has been passed requiring a 75% signup before a district can be approved.

Richfield continued leasing after the minimum requirement was reached until about 90% of the property owners were in on the deal.

Putting the play together cost Richfield an estimated $150,000 before the first well was even spudded. Although Richfield released no figures, on an average a drilling project like Richfield's at Silverlake usually costs 45% more than a comparable well in a rural area. Tough city drilling conditions, such as soundproofing, run up the cost.

In this case, Richfield selected a drill site on Sunset Boulevard, a main cross-town thoroughfare. The lot chosen was extensively resurfaced, fenced, and landscaped before the soundproofed rig was moved in. The result: an 8,045-ft. dry hole.

Texaco Buys Oil, Avoids Fight

• Company decision cancels Texas hearing on the issue of forced crude buying by a common purchaser.

A TEST of the Texas Railroad Commission's power to force a common purchaser to buy oil was averted last week.

A hearing slated for October 7 which spotlighted this issue was canceled early last week when Texaco Inc., decided to buy the oil after all.

Independents, immediately trumpeted "a clear-cut victory." Nevertheless, they were felt to be somewhat disappointed. Their feeling was that they had a good case. They believed they could win it before the commission and thus set a precedent which would have a heavy bearing on future disputes of this nature.

The hearing was set by the commission on request of three San Angelo operators, Byron and Henry Hoffman and J. H. Buchanan. They asked relief from an unusual situation (OGJ, Oct. 5, p. 107).

The San Angelo operators successfully completed a wildcat in Crockett County, West Texas, in October 1958 to bring in the B. & H. Queen sand field. The well was 6,000 ft. east of Halff field, where the Hoffmans and Buchanan are large operators. Buchanan built and paid for a gathering system in Halff field which is operated by Texas-New Mexico Pipeline Co., and the oil is purchased by Texaco.

When the B. & H. discovery well was completed, operators laid a pipeline from this well into the Halff system, but Texaco refused to purchase the oil.

The hearing was dismissed following a Texaco offer to take the crude on the same terms as it buys oil from the same operators in Halff field.

TIPRO Hails action . . . Harry C. Jones, president of the Texas Independent Producers and Royalty Owners Association, said Texaco's change of heart indicates that purchasers recognize that the "Railroad Commission will not permit discrimination between fields in buying crude oil.

"We feel a pattern has been established and the commission's power to abolish purchaser discrimination has been recognized."

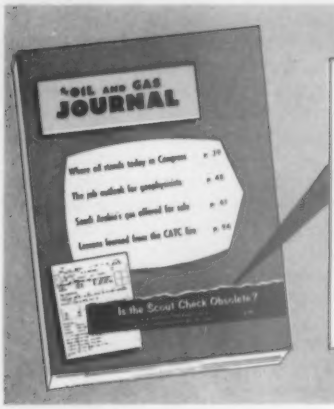
TIRPO was a party to the defunct hearing as an intervenor on the side of the independents.

Jones contended in a statement early last week that "despite contrary expressions," the Railroad Commission must have authority to make a common purchaser buy oil it might not want.

"That is not to say a purchaser can be required to buy more oil than it desires, but rather that it can be prevented from discriminating unreasonably against any production or field. Without such authority, the commission could not assure ratable take. And this is the foundation of conservation," Jones said.

The Scout Check Is Not Obsolete

. . . It outshines any alternatives proposed, scouts believe.



Editor's Note: In the August 3 issue, the Journal published an article entitled "Is the Scout Check Now Obsolete?". It was the first comprehensive story published in the industry on the changes taking place in scouting practices, particularly the move toward establishment of commercial services to report on wells.

The story attracted widespread attention and brought prompt reaction from the industry's scouts. The Journal invited the president of the National Oil Scouts and Landmen's Association to prepare an article reflecting the scouts' view on the current changes. This is his article.

William P. Allen, Chief Scout, Imperial Oil Ltd., and President National Oil Scouts and Landmen's Association.

SCOUT CHECKS will never be obsolete unless mutual cooperation in the oil industry ceases to exist.

The Oil Scouts' International Association, on behalf of its 38 district scout checks, has taken issue with a feature story appearing in The Oil and Gas Journal not on the question of whether changes are occuring in scouting methods, but because of the possible assumption that there is some inherent dereliction in scout checks in general.

That changes are being proposed and attempted in scouting methods was publicly recognized by our Association in 1958. A reprint in the National Oil Scouts' Newsletter of a paper delivered by myself to the Northwest International Oil Scouts' meeting in Regina, Canada reads in part:

"As you know, the boom has gone out of the oil business.

"We will likely never see another overly accelerated rate of growth in Canada as we have seen in the past decade. On the other hand, a slower more stable rate of growth is not entirely undesirable. However, in this period of consolidation and leveling off, or recession if you wish, there are many indications that scouting will be the first to bear the brunt on any belt-tightening.

"What are these indications?

"One check in Oklahoma was completely dissolved by management; many scouts there are no longer scouting.

"Commercial scouting firms are trying to spring up all over. Rumor has it that one commercial firm said they could completely blanket Oklahoma with 20 commercial scouts; an area which had approximately 75 company scouts before the shake-up.

"The standard well ticket has been incorporated into several checks with mixed blessings. About half the companies are using it.

"Some companies are advocating the formation of so-called 'Paper Checks'. The result of this I leave to your imagination.

"Many of these proposals have sprung up because companies are trying to economize, and this is only natural. However, it is to the credit of the ability of the scouts themselves that these schemes for the most part have fallen short in the eyes of management. Economy is not always preferential to efficiency."

On January 1, 1960, the National Oil Scouts and Landmen's Association will become the International Oil Scouts Association. Our membership has been faced with problems that are not greatly different from problems faced by other segments of the oil industry or other service organizations within the oil industry, and problems continue to face us.

However, there is one problem which never confronts a scout; one question which never occurs to him —and that is the question of loyalty to his company.

If a scout does not have this basic quality, he is a detriment rather than an asset to his company. I am defining a scout as an employee whose work and ability are of a nature that makes loyalty both valuable and necessary.

In other words, the scout I am talking about is the one who operates in a position of trust and reliability, whose experience and acumen will reward his company many times annually the money it costs to maintain him.

Some companies operate in such a way that this type of scout is actually of no benefit because the operation of these companies is not tuned to the necessity of quick and wide-spread leasing and exploration. Often this company finds itself in the position of wanting to keep abreast, but at the same time not wanting to face the expense of a full-time scouting personnel.

When a management finds itself in this quandry, it may seek a method of obtaining a flow of information from a particular area, none of which is necessarily accurate enough or confidential enough to base concrete action on, but all of which taken together may give it the information it requires. If the occasion arises, it can send in a trained scout to obtain timely and confidential information.

When a company finds this sort of operation indicated, it may begin to question the necessity in its own operations for an elaborate system of oral investigation, which is the scout check's insurance against faulty well tickets.

If a company's management does not find the scout check important to its operation, it will, of course, approach its problem from some other point of view more favorable to its operational procedures.

Scout checks are faced continually with this fluctuation of company participation, and consequently they flourish, ebb and sometimes die out,

WILLIAM P. ALLEN, chief scout for Imperial Oil Ltd., is a good example of the new breed of "businessman" oil scout who has replaced the "cloak and dagger" oil scout of earlier oil days.

The 36-year-old Allen, like most scouts today, relies on his technical knowledge to help him interpret reports, statistics, well logs, and other bits of information that might tip him off on the importance of a well. This technical information supplements the information he or his fellow scouts pick up in the field.

Allen, who headquarters in Calgary, has been scouting for Imperial for 15 years.

In addition to running Imperial's scouting program, he is serving this year as president of the National Oil Scouts and Landmen's Association. In this capacity, he wrote the accompanying article pointing out the value of the scouting profession to the oil industry.

and are born anew in other areas where the particular need of good oil scouts and oral check are required.

The scout checks. . . . Many economists have explained that our system of trade is based on a "self-regulating market."

Authorities on government speak of a system of "checks and balances." Scouts, too, have developed over the period of a hundred years, a system which has satisfactorily insured that one company with one scout may have the advantage of twenty scouts or fifty scouts, and at the same time have confidential information when it is required.

It is a delicate system of checks and balances, and is a self-regulating endeavor (providing the faults to be mentioned later do not occur). Thus, men who are highly competitive during 6 days of the week, become highly cooperative on the seventh.

Criticisms of the Oklahoma scout check were first printed by the oil scouts in their Tulsa Annual in August of last year. These criticisms were made by a management committee which took over the Oklahoma scout checks and managed it until only recently. In August of this year, I understand, some authority was returned to the scout-elected officers of the Oklahoma scouting association.

The Journal's article may lead the reader to assume that the charges made against Oklahoma can be applied to all scout checks. Scouts, of course, take exception to this article, not because it pointed out that commercial reports were under contract to some oil companies in the Rocky Mountain area, but because it attributed this fact to some malfunction on the part of the scout checks.

Scout checks will continue to operate in the Rocky Mountain area or any other area where there is sufficient interest to bring at least two scouts together.

Scouts are not infallible, nor are managers. Many men see the same phenomenon in many different ways. We all know the story of the three blind men and the elephant. What seems to be a rope to one, may be a tree or a snake to others.

I believe that the scout check is a basically sound operation which works to the benefit of the entire oil industry. I do not think it is obsolete, any more than any cooperative venture is obsolete.

It is true that scout checks may not suit the operations of some companies. Also, scout checks may fail their primary function, which is to report oil and gas field development economically to all participating firms.

It is also true that some companies now critical of scout checks had the least to offer in cooperation and information while reaping the benefits as members of scout checks.

There are two conditions which cause a scout check to fail:

. . . It will fail to operate properly when the management of a scout sitting in check does not maintain adequate communications with his scout.

All scout checks are run on a democratic basis. Each scout has a vote in the election of officers who assign districts and select methods of operations. Each scout votes on establishment and interpretation of rules and on any decision concerning infraction of rules. Officers are elected twice a year in some checks, once in others.

If management communicates regularly with its scout and outlines his company's desires on questions being voted by the check, there is little chance that the check will not be conducted according to the direction of the majority of the participating companies. Lack of communication often leads to arbitrary actions by company representatives which compromise company policy.

. . . The scout check will fail to operate efficiently and economically when it is constantly used as a temporary training program for personnel which does not remain in scouting long enough to repay the check for the time required to train them, especially if the personnel has little or no real interest in the scouting profession.

Under this combination of circumstances, the trainee does not usually make a good scout. His work as a consequence, is often done by other scouts in the check. He has no initiative to cover his assigned district, his work is not up to standards, and he is sometimes asked to withdraw.

Disciplinary action against him is often resented, and if his management does not understand the necessity for strict adherence to check regulations, he may protest this action as an infringement on the policy-making function of his company.

Actually, the scouting profession is flattered that management considers it an excellent ground for practically every phase of the producing oil industry.

Conclusion . . . If scout checks appear to fail because of these reasons, it does not follow that the basic idea of scout checks is obsolete, or that all scout checks are failing nor that the scout check is not serving industry.

The problems facing scout check are no greater and may even be small by comparison to those facing the untested alternatives to scout check.

In reality, scout checks everywhere are looking for ways to increase efficiency and at the same time reduce cost. Each operating area has its own problems and solutions because the needs of any operating area differ vastly from the next. Self-criticism is being used and constructive criticism is being sought from management. Destructive criticism serves no purpose.

Scouts feel, with some justification, that they not only give their company its money's worth in the field and in the check, but that they supply a service to the industry in the form of the Yearbook, Volume 29 of which is ready for publication.

This Yearbook records oil and gas development in the United States and Canada and is available to any user in the industry. The district scout association, the scout check, is the main source for the information collected for the Yearbook, which is the entire support of the International association.

Big Coal Line Talked

. . . to cut costs of delivering West Virginia coal to East Coast. Under consideration is a 350-mile 24-in. pipeline which would be operated by Texas Eastern.

TWO INDUSTRIAL giants—one in pipelining and the other in mining—may combine in a project to deliver coal to several eastern utilities at a price lower than fuel oil.

The project envisions a coal pipeline from the West Virginia-Pennsylvania coal fields to the East Coast.

A feasibility study of the operation has been made by Texas Eastern Transmission Corp., big operator of natural-gas and petroleum products pipelines from the Southwest to the industrial Northeast.

The report is being studied by executives of Pittsburgh Consolidation Coal Co., one of the nation's major soft-coal producers.

A. R. Matthews, Consolidation president, told The Oil and Gas Journal "the project is in its very embryonic stages. No decisions have been made—no contracts signed."

He added Consolidation was in the position of having plenty of coal and looking both for customers and a cheap way to get coal to them.

Under the plan Consolidation would be the coal supplier. Texas Eastern would build and operate the 350-mile 24-in. pipeline, using rights-of-way it already controls in the region.

Four big utilities reportedly already have been approached as customers of the pipeline. They include Consolidated Edison Co. of New York, Public Service Electric & Gas Co. of New Jersey, Pennsylvania Power & Light Co. of Allentown, and Philadelphia Electric Co. (Journal Newsletter, Sept. 21).

Executives of the steam-power generating and distributing firms all expressed interest if the project proved feasible but added "talks are still in the preliminary stage."

One big talking point Consolidation will have is its year of experience in operating the world's first coal pipeline—a 10-in. 110-mile steel artery from Cadiz, Ohio, to Cleveland Electric Illuminating Co.'s Eastlake plant.

Technology of idea . . . Texas Eastern officials confirmed they had made a study of a coal line from Moundsville, W. Va., to the New York-Philadelphia areas.

But they declined to comment on details of the report pending further negotations.

From trade sources, however, the Journal learned that the feasibility study reported favorably on the project. No insoluble technical difficulties were discovered, although several possible "bugs" may remain to be worked out.

Profile of the line reportedly showed that grades of more than 18° will be encountered. This is not expected to present too much trouble despite an 18°-grade limit placed on the Cadiz-Cleveland line.

Steep grades in the line could pose pumping, line erosion, and clogging problems. Engineers reported, however, they learned in the Ohio line that erosion is a problem only for the first few miles. From then on, the coal particles are rounded off and give no trouble.

The coal is ground into fine particles, mixed with water, and pumped in a slurry under pressure through the line. The Ohio line had a severe clogging problem early in its operations. Part of the line was dug up and unplugged.

The cause of the trouble was traced to poor filtering. This allowed oversized coal particles to enter the line, settle at the sags, and clog the flow.

The necessity of keeping the coal from settling out of the slurry will pose one difficulty, however: Delivering the coal to more than one take-off point.

Consolidation's Matthews said the coal pipeline concept was not ideally suited to a pipeline network with several drop points. He declined to say whether four take-off spots were being considered or a central delivery point with the coal being trucked to customers from there.

Economics . . . A big appeal of the line for the utilities is the estimate that the coal can be delivered just under the price of fuel oil.

This advantage derives from a 20-year fuel contract which Consolidation Coal reportedly is offering. It also stems from labor savings effected at the mines and from the low labor factor in coal pipelining.

Consolidation moved more than a million tons last year over its Ohio line to Cleveland Illuminating, which reported it made substantial savings over rail transportation. If coal can be delivered into the New York-Philadelphia region at a price lower than fuel oil, it would mean attractive savings to utilities that find fuel their major cost.

Typical of utility reaction is the comment of a Consolidated Edison spokesman: "We're willing to listen if anybody has anything to say about moving fuel to a power plant."

Legal trouble? . . . Insiders fear the railroads many cause the most trouble.

The rail lines stand to lose considerable tonnage in coal hauling if the pipeline is put into operation. Their opposition could come either in the form of challenging the project in hearings before federal agencies or attacking in court this double use of rights-of-way.

Texas Eastern owns multiple rights for a line from the Oakford storage basin in western Pennsylvania through the areas to be supplied. Using this right-of-way would lower the investment required for the project and is another economic factor behind the line's price advantage.

Executives close to the project admit the line is from 2 to 3 years from completion even after a decision to undertake the job is made.

Hayward | Stephenson | Ramey | Sherborne | Elkins

Five Are Cited by SPE for Outstanding Contribution to Oil

FIVE MEN were honored last week for their outstanding contributions to the oil industry. The Society of Petroleum Engineers of AIME presented the awards at its 1959 fall meeting in Dallas.

Wayne E. Glenn, manager of Continental Oil Co.'s production department in Houston, was introduced as 1960 SPE president at the Dallas meeting. He will take office in February.

Recipients and their awards are:

. . . **John T. Hayward,** the Anthony F. Lucas Gold Medal, for "development of the mud logging process . . . and successful design of a submersible drilling barge." About 90% of all submersible barges in use in the U. S. were built under license from Hayward, who now lives in semi-retirement in Clearwater, Fla.

. . . **Eugene A. Stephenson,** the John Franklin Carll Award, "for his contribution as . . . a dynamic investigator in the field of engineering research." Stephenson, former head of the petroleum engineering department at the University of Kansas, is now a professor emeritus.

Wayne E. Glenn

. . . **H. T. Ramey,** the Cedric K. Ferguson Medal, for his paper "Field Results of South Belridge Thermal Recovery Experiment." The award is presented annually to the author of the best petroleum technical paper by an AIME member under 33 years of age. Ramey is a project engineer for General Petroleum Corp.

. . . **Lloyd E. Elkins** and John E. Sherborne, Certificates of Service, "for unusual leadership and devoted service." Both men are former chairmen of the petroleum branch of AIME. Elkins is production research director for Pan American Petroleum Corp., Tulsa. Sherborne is manager of production for Union Oil Co. of California, Brea, Calif.

New president . . . Glenn had been Conoco's assistant Rocky Mountain regional production manager for several years before taking over his post in Houston recently.

He has been active in industry associations, particularly AIME and API. He was chairman, director, and section delegate to the Pacific petroleum chapter of AIME, member of the technology committee, director of the Denver petroleum section, and a director of Society of Petroleum Engineers. He has been chairman of five major API committees and was 1956 API Rocky Mountain district chairman.

Seaton Fans Fires for Realistic Gas Laws

. . . and taps industry to "take the lead" in championing corrective legislation. FPC's job now "almost impossible."

A TOP administration official—Interior Secretary Fred Seaton—is urging the industry to "take the lead" in seeking new natural-gas legislation.

Seaton, speaking at the American Gas Association convention in Chicago last week, had this to say:

"It is the sincere hope of many, including myself, that you of the natural-gas industry will yourselves take the lead in seeking appropriate legislation which will insure a more realistic basis for the relationship between the Federal Power Commission and your industry and at the same time protect the interests of the consumers of natural gas."

Seaton opened his discussion of the problem with the statement that "It is generally recognized that the Federal Power Commission has an almost impossible job on its hands under existing law."

Statesmanship needed . . . He said that before any constructive legislation is possible, some "reasonable" method must be found to reconcile the interests of producers and suppliers with those of consumers.

"If something constructive is to be accomplished," he said, "a high order of statesmanship will be required, both inside the Government and in your industry."

Whether Seaton's remarks could be considered an indication that the administration might actively back a natural-gas bill is, of course, still a matter of conjecture.

Industry officials have expressed the view that positive support by the President is needed if corrective legislation is to have much chance of winning congressional approval.

Fair Trading Gasoline—Good or Bad?

• Dealers and jobbers in New Jersey and Pennsylvania favor fair-trade practices, but a major supplier sees them as threat to brand gasolines.

NEW JERSEY has been the battleground for the most severe, most frequent, and most drawnout gasoline price wars in the nation. At one time, the state was known to marketers as "bloody Jersey."

But at the moment, no major price war is being waged in New Jersey. Credit for the peace is given to fair trade.

Is fair trade good? Marketers disagree.

Atlantic Refining Co. surveyed 300 dealers and 75 jobbers in New Jersey and Pennsylvania on their opinions of fair trade. A whopping 85% of the dealers and more than 70% of the jobbers in both states want to see fair trade continued.

But J. G. Jordan, Shell Oil Co.'s marketing vice president, fears fair trade could wipe out major brands in some markets since unbranded gasolines (those not carrying the refiner's name) do not come under fair-trade provisions. Unbranded gas could undercut the major brands' price.

A bill pending in Congress would legalize fair trade on a national basis. Forty-one states permit fair trade now, but gasoline is being fair traded in only four states, New Jersey, Pennsylvania, North Carolina, and Connecticut.

Other states are considering fair trade. The extent to which it is adopted could have considerable effect on the oil industry.

Arguments for fair trading:

Atlantic's survey of New Jersey dealers showed fair trade has worked out better than the dealers expected.

Despite the number, length, and severity of Jersey's price wars, only 55% of the dealers first thought fair trading would be helpful. Now after a 3-year trial, 85% favor it.

J. H. (Jack) Picou, Atlantic's director of market research, disclosed the results of the survey at a meeting of the North Carolina Oil Jobbers Association, said the survey showed:

... **A majority** of both dealers and jobbers support the fair-trade idea.

... **Fair trading** has been especially effective in bringing stability to New Jersey markets that had been in price agony for many years. The main concern in that state at the moment is growth of unbranded gasoline sales—but the concern is not widely felt.

... **Fair-trade pricing** is popular in Pennsylvania, too, but not as much as in New Jersey. There are still some enforcement problems which are giving some dealers and jobbers concern.

New Jersey dealers who favor fair trade give these reasons: It stabilizes prices, 56%; it allows dealers a fair profit, 35%; and it helps small businessmen, 17%.

Those opposing fair trade listed its weaknesses as: Noncompliance or difficulty of enforcement, 9%; reduces ability to meet price competition, 3%; profit margin too low, 4%; hurts free enterprise, 7%; and can't meet unbranded prices, 4%.

Pennsylvania survey . . . While Pennsylvania's dealers also favor fair trade, they weighed the advantages and disadvantages differently than New Jersey dealers.

This could be because fair trading is not as old there. It was first tried in Pennsylvania from June 1956 to April 1957. It was resumed in November 1958.

The Pennsylvania dealers see noncompliance or difficulty of enforcement as a much more serious disadvantage than those in the neighboring state. Here's how the Pennsylvania dealers rate the disadvantages: Noncompliance, 26%; reduces ability to meet price competition, 9%; profit margin too low, 7%; hurts free enterprise, 4%; and can't meet unbranded prices, 3%.

While 65% of the Jersey dealers saw no disadvantage in fair trade, only 46% of the Pennsylvanians regarded it as a panacea.

Only 39% of the Pennsylvania dealers saw its value as a price stabilizer against Jersey's 56%. Otherwise, they saw it pretty much alike insofar as its benefits are concerned.

There was a marked difference between dealers of the two states on whether fair trade has helped business. In Pennsylvania, a resounding 80% said it has. In New Jersey 56% said it helped business. And in New Jersey, only 5% said it made no difference, while in Pennsylvania, 23% said fair trade neither helped nor hurt business.

Replies from jobbers indicate that the growth of unbranded gasolines is more marked in New Jersey than in Pennsylvania. In New Jersey, 24% said fair trade helps unbranded gasolines, compared with only 16% in Pennsylvania. The reverse is true in the matter of noncompliance. In Pennsylvania, 22% of the jobbers list noncompliance as a disadvantage, compared with 8% in New Jersey.

The jobbers agree with retailers that price stability, better profits, and help to small businessmen were attributes of fair trade. But jobbers add another advantage—"better" competition. According to the jobbers, it shifts the emphasis on competition to service instead of price.

Arguments against fair trading:

The dire prediction that "brands might well become liquidated under fair-trade practices" was made by Jordan at a meeting of the Ohio Petroleum Marketers Association.

Jordan told the group that the future of fair trading in the oil industry is not bright.

He gave as reasons:

... **The scope, size,** and divergence of interests of the retail segment is too great for effective administration and enforcement.

... **In major markets,** where its application is most needed, big segments of the competitive forces have not considered fair trading as needed.

... **Expanded and continued** use of fair trade may well injure the status of branded products or even lead to their liquidation.

... **The questionable legal** status of fair-trade laws.

... **The widespread use** of fair-trade

laws may be merely a step toward encouraging much more rigid and restrictive legislative control.

Jordan reviewed the history of unbranded outlets in New Jersey. When fair trading was discontinued in 1950, there were about 270 independent stations. This number had dropped to about 165 when fair trading was resumed in 1956.

"With the advent of fair trade, their number started increasing again—and rapidly," he said.

By the end of 1957, Jordan added, there were almost 300 independent stations. In March 1958, there were about 435, and in November 1958 there were more than 550. At the moment, Jordan said, there are almost 600 independent stations in New Jersey selling about three times more gasoline than prior to fair trade.

"You can make your own predictions as to the next sequence of events," he told the association.

Shell, Jordan said, made the decision to fair trade in New Jersey "with considerable reluctance." He cited the pressures of the dealer association, the support of fair trade by Sen. Hubert Humphrey, the feeling that fair trade was the lesser of two evils, and the contention that, if it was not tried, the industry would be harassed by legislation and investigation both in the New Jersey legislature and in Congress.

Jordan questioned "those suppliers who run two ways at once—and sell not only through branded outlets but also to the independents." He estimated 75% of the independents' supplies are originating from major-company refineries.

Suppliers who are selling to the independents and are also fair trading are really not making much of an effort to enforce fair trade, Jordan said. It would seem, he said, that they are in the uncomfortable position of either placing their unbranded dealers in a straitjacket or of paying only lip service to fair trade.

Both the Department of Justice and the Federal Trade Commission oppose fair trade, according to Jordan. He quoted John W. Gwynne, FTC chairman, as stating "the fixing of resale prices is inconsistent with the American system of free, competitive enterprise and is contrary to the public policy expressed by Congress in the antitrust laws since 1890."

Jordan questioned if fair trading will continue to be a success in New Jersey. It has been in existence only 3 years, he said.

"And now," he concluded, "there are some indications that it may just about run its course."

Dome Wildcat Hits

. . . in East Texas 'barren' area on Texaco farmout.

WHIFFEN ESTATE, Inc., Dallas independent operator, has completed its 1 Daniel Memorial Orphanage successfully to establish commercial production on the west flank of the Butler salt dome in Freestone County, Texas.

On potential test, the discovery pumped 112 bbl. of 33.6°-gravity oil in 24 hours from casing perforations at 4,708-20 ft. in the Woodbine. Casing pressure was 190 psi. and tubing pressure 25 psi.

Thus, another of East Texas' famed 18 "barren" interior domes has surrendered to the wildcatter. The numer of unproductive domes has been trimmed to 13.

The Whiffen strike is in southeastern Freestone County in Simon Sanchez Survey about 2½ miles southeast of Butler townsite. Location is on an 821-acre farmout from Texaco Inc., major leaseholder around the dome and one of the most active and successful of East Texas dome explorers.

The Butler discovery well was completed just 75 ft. to the east of a dry hole drilled a few months back by W. C. Perryman, Athens, Tex., operator. The latter well, which ran 302 ft. low to the discovery, found only a show of oil in a Woodbine section not present in the Whiffen well.

R. A. Graddy, general manager for Whiffen, said last week that further drilling is planned but that the next location is undecided. Location for the discovery was made for Whiffen by Richard R. Scurlock of G. C. Clark Consulting Geologists, Tyler, Tex.

Higher Octanes

. . . promised by new Ethyl manganese additive in TEL.

MOTOR 33 Mix, a combination of tetraethyl lead and a manganese additive, is now being offered commercially by Ethyl Corp.

When mixed with the most responsive gasoline, Ethyl says, Motor 33 Mix can increase the octane rating as much as three numbers more than can TEL alone. Cost can be as little as half the cost of refinery processing to get the same results.

The new blending compound in a mixture of TEL and the manganese compound — methylcyclopentadienyl manganese tricarbonyl—in proportion of 0.05 gram of manganese for each milliliter of TEL. The additive was announced 2 years ago under the name AK-33X (OGJ, July 8, 1957, p. 84).

Ethyl says the new mix will permit less severe catalytic reforming and will stimulate the use of natural gasoline or virgin light naphthas. By permitting less severe reforming, the additive will increase gasoline yields.

The manganese compound was found to have its greatest effect in those gasolines which react best to TEL. It is most effective in alkylates and paraffinic naphthas, moderately effective in olefins and least effective in aromatics. Its greatest benefits come when it is used in higher concentrations of TEL.

Humble Moves Gas

. . . through new line linking King Ranch, Houston.

HUMBLE Oil & Refining Co. began moving gas last week through its new 30-in. pipeline from King Ranch into the Houston industrial area.

The pipeline project is part of a $75-million program to develop gas reserves in 13 southwest Texas fields. A huge gas processing plant is now under construction at King Ranch and will be completed by mid-1960. Also 170 miles of gathering lines are being completed.

The new 30-in. line is 238 miles long and ties into Humble's existing gas delivery system to supply eight major industrial customers in the Houston and Beaumont-Port Arthur areas. Humble's Baytown refinery also will be supplied.

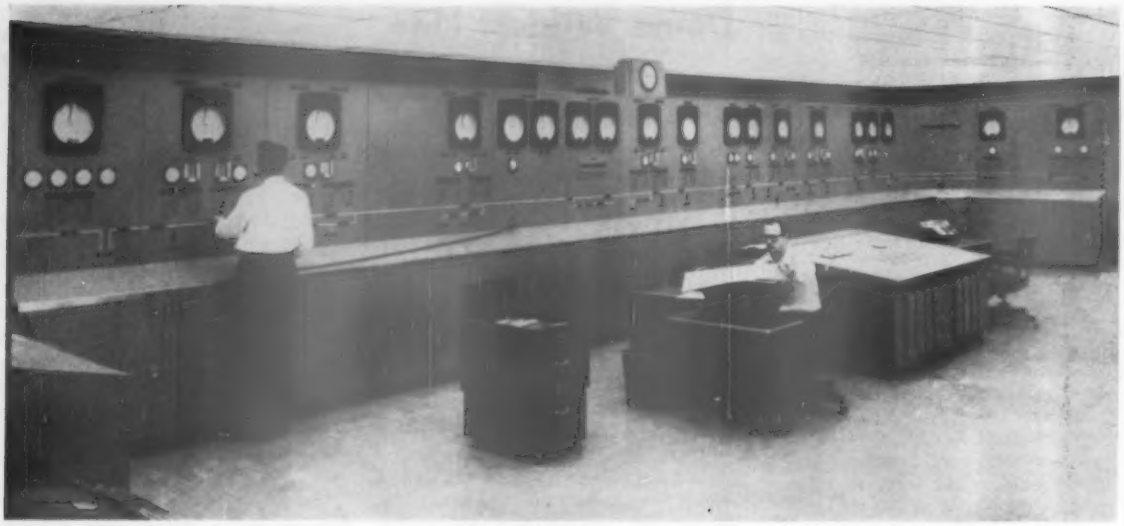
Capacity of the line is 330 million cubic feet daily, and this can be increased to more than 600 million when compressors are installed.

Until the gas processing plant is completed, the new line will take its gas directly from the producing fields. When the plant is operating, the processed residue gas will be used for cycling and pressure maintenance in nearby fields and to supply the line.

Since the gas delivery program is an intrastate operation, Humble did not have to get approval of the Federal Power Commission to market it to its industrial customers.

Humble's existing gas system in the Houston-Beaumont-Port Arthur areas has operated since 1937.

Panama, Inc., Houston, was the contractor on the new 30-in. line. Construction began in mid-January. Hudson Engineering Corp. is building the gas plant.



FLOW of products through Laurel's 447-mile line is controlled remotely.

Products Pipelining Changed by Laurel

• More products made from imported crude will move into Pennsylvania and Ohio as this big line steps up its throughput. Two lines already out of service.

THE NEW Laurel Pipe Line Co. products line has already had an important impact on the status of some other lines and on supply and marketing in Pennsylvania and Ohio.

But its influence in these areas, and on technology as well, will grow as volume increases permitting maximum advantage from the world's largest-diameter and largest ultimate-capacity products line.

These facts emerged last week in discussions with presidents and operating executives of major oil companies and pipelines who attended the dedication of the 447-mile line in Harrisburg, Pa. The line is 24-in. at its origin in the Philadelphia refining area and telescopes down to 20-in., 18-in., and 14-in. at its Cleveland terminus.

Experience in operating the line since March 1 has demonstrated the value of Laurel's basic design features, according to William J. Wilkins, Laurel president. The features include the advanced instrumentation and remote control for pumping through such a large line.

Interfaces in the 24-in. pipe of about 700 bbl. are consistent with preliminary design estimates.

Strategy . . . Laurel's long-range strategy, with provision for significant expansion, aims at future low-cost, large-volume transportation at a growing rate.

It will permit increased penetration of products from imported crude oil into inland markets.

Throughput has been running between 90,000 and 100,000 bbl. daily. Shipments are expected to increase with winter fuel-oil demand. Maximum capacity at the initial booth station is 240,000 bbl. daily.

Rates are based on those existing in the area. They are regarded as generally competitive. Examples: from Philadelphia to Pittsburgh, 22 cents; to Cleveland, 38 cents.

So far shipments have been made only by the three owning companies —Gulf Oil Corp., 40%; Sinclair Pipe Line Co., 35%; and Texaco Inc., 25%. They have 21 terminals for receiving deliveries. Laurel is seeking other shippers and is trying to get more volume, particularly in Ohio.

Impact on other lines . . . Laurel's impact on the other products lines in its area has been spotty.

Sinclair's Marcus Hook - Cleveland 6-in. line, which had been running at full capacity at 1,400 psi., was withdrawn from service in June and filled with nitrogen. Several possible uses for the line are being considered.

Tuscarora is enjoying peak business with throughput of 32,000 bbl. daily for its line having a maximum capacity of 35,000 bbl. daily. Esso has increased shipments. Cities Service and Pure are new shippers for Tuscarora. Last year throughput was about 27,000 bbl. daily.

The Sun and Mobil lines have not been affected by Laurel.

Shipments through the connected lines of Southern, Eureka, and National Transit from Philadelphia to Pittsburgh were discontinued after Laurel went into operation.

Texas Eastern's Little Big Inch products line is regarded as competitive with Laurel as far east as Middletown, Ohio.

Supply, marketing effects . . . There have been various changes on supply and marketing programs because of Laurel.

During Gulf's nationwide service-station expansion program 2 years ago, outlets in Ohio were increased. Gulf has six terminals on the Laurel line in Pennsylvania and one at Cleveland.

Sinclair's supply pattern has not been changed by Laurel. Sinclair switched to Laurel when it discontinued using its Philadelphia-Cleveland line. Sinclair can still ship advantageously from its Chicago refinery to Cleveland. Sinclair has eight terminals on Laurel in Pennsylvania and one at Ellsworth, Ohio.

Texaco had no pipelined products westward until Laurel connected its Eagle Point, N. J., refinery by a feeder line. The high cost of the river crossing of this line is reflected in in-

creased tariff rates. Texaco has four Laurel terminals in Pennsylvania and one at Ellsworth, Ohio.

Shipments into Ohio by barge and tank truck from Texaco's Lawrenceville, Ill., refinery have been discontinued. This volume has been diverted elsewhere.

Steps toward getting the benefits of Laurel's future low-cost transportation will be taken gradually. According to reports, unusual effort is now being exerted by the three Laurel owners to expand marketing facilities in Ohio.

Interest in 335 Wells Sold

CHRISTIE, Mitchell & Mitchell Co., Houston, has paid $5 million for Waterford Oil Co.'s interest in 335 oil and gas wells in Wise County, Texas, and other surrounding counties.

Waterford held interests of one-fourth to one-third in the wells, as well as 250,000 acres in the area. The wells produce about 3,000 bbl. of oil and 65 million cubic feet of gas daily.

CM&M's purchase also included Waterford's interest in CM&M's gas products plant at Bridgeport. The plant's capacity is 150 million cubic feet of gas daily. It recovers 250,000 gal. of liquid daily.

Chicago Line Finished Early

• Midwestern completes line from Portland, Tenn., now turns to line running south from Canadian border.

MIDWESTERN Gas Transmission Co. began serving the Chicago industrial area nearly a month ahead of schedule last week when it turned the valve that sent natural gas through its newly completed 350-mile line from Portland, Tenn.

Midwestern, a wholly owned subsidiary of Tennessee Gas Transmission Co., began construction of the line only last July, but speeded the work by hiring five pipeline contractors to operate six spreads.

Four other contractors did five river crossings and still another contractor built a compressor station at Portland.

The amount of the immediate throughput for the new 30-in. line is limited until Chicago District Pipeline Co. completes a 50-mile 36-in. system in the Chicago area to transmit Midwestern's gas to three utilities. Existing facilities of Chicago District are taking the gas for the present.

Midwestern's contracts call for deliveries of 360 million cubic feet daily by the end of the third year. Northern Indiana Public Service Co. will take 200 million, Peoples Gas Light & Coke Co. of Chicago 100 million, and Northern Illinois Gas Co. 60 million. Peoples Gas is the parent company of Chicago District Pipeline.

N. W. Freeman, president of Midwestern, turned the valve at a point near Joliet to begin the initial service of the company. Midwestern was formed by Tennessee Gas to tap the big north central market and currently has an application before the Federal Power Commission to build a 504-mile 24-in. line from the Canada-Minnesota border to import Canadian gas into Minnesota and Wisconsin.

FPC is speeding action on the new application and will hear oral arguments October 20 in Washington. Meanwhile, Tennessee Gas is completing a major construction program on its existing system to move additional Texas and Louisiana Gulf Coast gas into the Midwestern lines at Portland.

PIPELINE BRIEFS . . .

Crude-oil deliveries through Trans Mountain Oil Pipe Line Co. in September averaged 131,568 bbl. per day compared to 56,264 bbl. per day for the same month in 1958. The estimate for October is 104,000 bbl. daily.

A **$7,000,000 expansion** program by Washington Natural Gas Co. is planned for 1960. This is about the same construction budget as was approved for 1959 permitting the addition of 12,000 customers. Washington Natural is supplied by Pacific Northwest Pipeline Corp.

A **joint venture** on four spreads for Northern Natural Gas Co. in Iowa and Minnesota has been announced by R. H. Fulton & Co., Lubbock, Tex., and Curran & Co., Great Falls, Mont. D. M. Curran, president of Curran & Co., is handling field supervision for the joint venture, operating as Fulton & Curran. The projects include one spread working on 30-in. loops, two on the Farmington-Duluth 20 and 24-in. line, and one on a 55-mile 16-in. line to St. Cloud, Minn.

A **40-mile 4 to 10-in.** crude-gathering system in the Virginia Hills area of Alberta is scheduled for completion this week by Federated Pipe Lines, Ltd. Mannix Co., Ltd., has the construction contract. Mannix also is laying 50 miles of 3 to 10-in. gathering line for Pembina Pipe Line to be completed by the end of October.

Four new pumping stations will be installed on the Edmonton-Toronto crude line of Interprovincial Pipe Line Co. next year. Two stations are planned for Manitoba and two for Wisconsin. Capital expenditures for Interprovincial next year are estimated at $9.3 million.

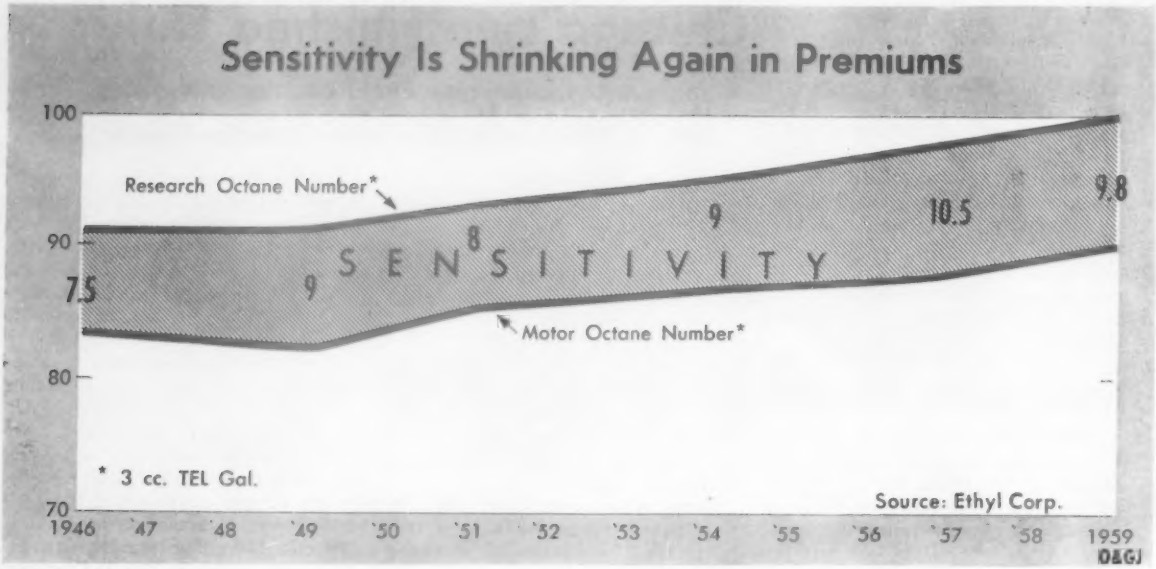
Construction will begin this week on 125 miles of 8, 10, 14, 18, and 20-in. by South Texas Natural Gas Gathering Co. in Jim Hogg County. O. R. Burden Construction Corp., Tulsa, has the contract. Burden will use a spread which has been working for Humble in the same area.

Also for Pipeliners . . .

IN THE NEWS: Steel shortages are beginning to show up in the oil industry, especially on line pipe (p. 86) . . . Texaco buys oil, avoids test on issue of forced crude buying by a common purchaser (p. 89) . . . A 350-mile 24-in. coal pipeline talked from West Virginia to East Coast (p. 92) . . . Seaton tells gas industry to take the lead in pushing for a new bill freeing it from FPC controls (p. 93) . . . Humble starts moving more gas into Houston (p. 95) . . . Laurel Pipeline dedicated but it's already making itself felt in marketing (p. 96) . . . Panhandle Eastern wins fight to abandon service to Michigan Consolidated (p. 102).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are carried in Pipeline Briefs.

PLUS THIS TECHNICAL REPORT: How El Paso Natural maintains three types of cooling systems (p. 182).



Refiners Face Another Problem: Reduce

- Ethyl's 1959 report underscores the situation confronting refiners: How to reduce fuel sensitivity, and still keep up the octane race—all without going broke.

U. S. REFINERS find themselves in a rather familiar situation—between a rock and a hard place.

Here's their problem: Cut down on gasoline sensitivity, and at the same time keep up the pace in the octane parade.

The solution won't come easy—and it will prove costly.

The problem was pointed up in Ethyl Corp.'s latest survey of premium gasolines. The study shows sensitivity —the difference between Research and Motor octane numbers—dropped from 10.5 in 1957 to 9.8 this year in premium gasolines and from 10.8 to 9.6 in super premiums.

The trend definitely is toward reducing sensitivity even lower, to 9 or below. That means refiners must make a fuel with higher Motor octane, as related to Research octane, for a less sensitive fuel.

The problem boils down to composition.

Refiners must replace olefins with saturated hydrocarbons by alkylation and isomeration. It's costly, but there's no other way to go. Refiners already have started backing out olefins and increasing aromatic content in premiums, but they still have further to go.

A look at blends . . . Hydrocarbon composition has become an increasingly important factor in motor-fuel blends.

Ethyl's 1959 report shows the average blend of premium had 18% olefin content—down from 24% in 1957. Aromatics content was up to 29% from 24%. Saturates increased 1%, from 52% to 53%. (See chart).

The olefin content of super premiums dropped 3%, from 18% in 1957 to 15% this year. Aromatics content dropped from 30% to 29%, while saturates increased from 52% to 56%.

The report also contains a rundown on average properties of both premium and super-premium gasolines in comparison with previous surveys dating back to 1946 (See table).

The latest survey is an analysis and evaluation of 131 samples of commercial premium and super-premium fuels. To provide a base for representative correlation, the fuels all were blended with TEL concentrations of 3 cc. per gallon. This eliminated lead as a variable.

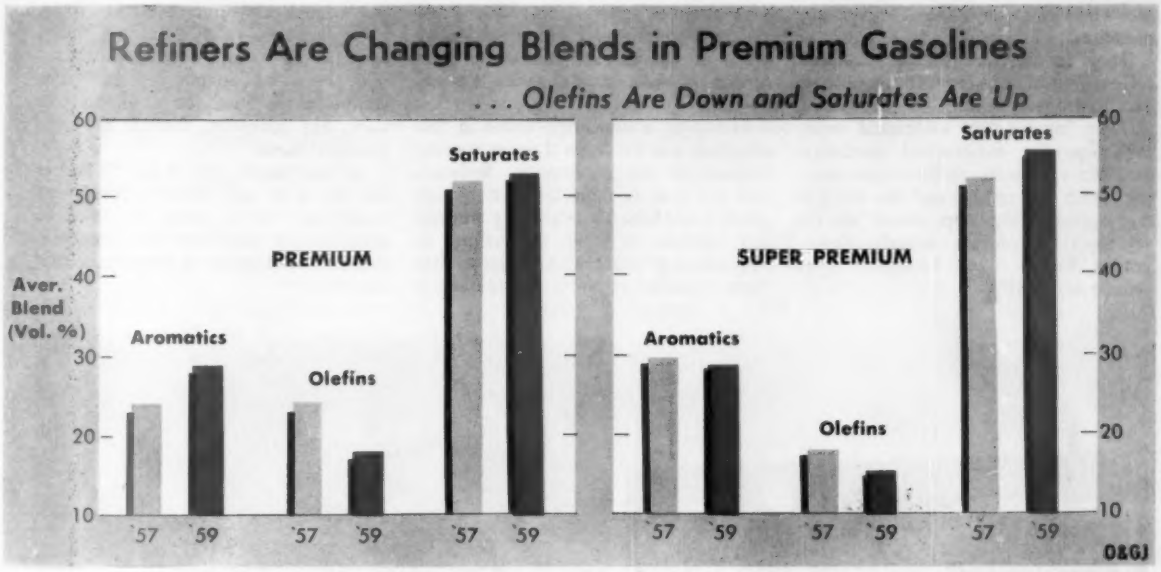
Engine speeds . . . Hydrocarbon composition was of less importance in the past with engines operating at lower speeds. Then, knock was limited to full-throttle operation.

Now, with more and more high-powered, high-compression engines

A Rundown on Ethyl's Premium-Fuel Studies

	PREMIUM						SUPER-PREMIUM	
Year	1946	1949	1951	1954	1957	1959	1957	1959
No. of Samples	12	20	31	63	91	112	12	19
R.O.N.*	90.8	90.8	92.8	94.7	98.1	99.7	100.8	102.7
M.O.N.*	83.5	82.2	84.7	86.3	87.6	90.2	90.0	93.1
Sensitivity	**7.3**	**8.6**	**8.1**	**8.4**	**10.5**	**9.8**	**10.8**	**9.6**
TEL Susceptibility (0.0-3.0 cc. TEL/gal.):								
R.O.N.	11.2	11.5	11.5	10.3	7.0	6.2	6.3	5.9
M.O.N.	10.0	8.9	9.5	8.6	7.2	7.2	7.1	7.0

*With 3 cc. of TEL.



Gasoline Sensitivity

turning up in the car population, knock is occurring at part throttle. Spark timing of these high-powered engines is advanced at part throttle and air-fuel mixture ratios are lean to improve fuel economy. The cumulative result is to downgrade sensitive fuels.

So the refiner must tailor his fuels to meet the part-throttle knock limitation. Since test conditions of M.O.N. engines are now more representative of road conditions than they used to be, M.O.N. is becoming more important as a criterion. As a result, the sensitivity is being watched much more closely.

Significance . . . Octane ratings and composition studies are important only as yardsticks to measure ultimate performance—how the fuel performs on the road. Digging deep, and using computers for the first time, Ethyl came up with this summation of the relationship:

. . . Research and Motor octane numbers, as measured in the lab, still give reasonably good estimates of road antiknock performance.

. . . At full-throttle and low speeds, road performance is primarily dependent on R.O.N. At higher speeds, M.O.N. is the more indicative of the two.

. . . The combined knowledge of both octane numbers usually provides a good index of road performance at all speeds. But, when only one octane rating is available, it can be combined with an index of fuel composition to give equally good predictions.

. . . Paraffinic components are most valuable in reducing fuel sensitivity. Maximizing paraffins will generally result in optimum road performance for both full-throttle and part-throttle operation. When all other factors are equal, the hydrocarbon composition has a more pronounced effect at high speeds. Also, definite improvements in high-speed performance can be achieved by backing out olefins and increasing aromatic content.

. . . Part-throttle road performance, an increasingly important factor, is controlled almost exclusively by motor number. In fact, at high speeds, R.O.N. exerts a negative influence. Increasing R.O.N. can actually result in a lower road octane number.

Bad actors . . . Olefins are the poorest performers on sensitivity under high-speed conditions. Aromatics are better, and saturates are the best.

The sensitivity aspect in premium fuels throws a cloud on cracking, polymerization and reforming.

Cracking and polymerization produce gasoline stocks with the highest sensitivities, while catalytic reformates have sensitivities higher than alkylate and the straightrun components.

The Ethyl report shows that olefins and aromatics contribute to fuel sensitivity in about a 60-40 ratio. It's desirable to play down these fuels and use isomerized paraffins and more alkylate. The refiners, who so far have dabbled with isomerization, will find themselves pushed into adopting it as a standard process unit.

There are still complications. As octane numbers increase, the operation of catalytic reformers will become more severe. The resulting product—while higher in octane numbers—will also be more sensitive, canceling some of the gains obtained by this route.

The high capacity of cat cracking available means a new processing problem when it comes to backing out olefins in any substantial volume.

About 28% of the total gasoline pool consists of cat-cracked stock, and about half of that goes into premium fuels. Since premium amounts to about 30% of the pool, the cat-cracked portion of the premium segment assumes major significance.

On a volume basis, replacing this stock with one of lower sensitivity is quite difficult from a practical basis. Some can be backed out and replaced by isoparaffins and alkylate can be added. Both of these have volume limitations. At the same time, the high cat-cracking capacity can't be ignored.

Increasing the lead content is one route which easily can be followed. So far, refiners have not approached the 3 cc. per gallon level. In fact, they have tapered off slightly in lead content. Average concentration in the last month ran 2.52 cc./gal. in the premiums, compared with last year's average of 2.53. Stepping up paraffin content will make the fuel blends more susceptible and increase effectiveness of antiknock compound.

Other routes . . . For some time refiners have resorted to splitting cat naphthas into high-octane and low-octane cuts for better balance in blending to finished gasolines. Now they

are thinking of two further approaches.

They involve the further catalytic reforming of cat-cracked naphthas, and hydrogen treating of the stocks.

They involve two additional treating steps for cat-cracked naphthas: catalytic reforming or hydrogen treating. Both are costly, and the straight hydrogen-treating step which merely saturates the olefins, actually downgrades R.O.N. even though it does reduce sensitivity.

A number of refiners have been experimenting along these lines. Quite a few do charge cat naphthas to their reformers when spare capacity is available.

However, a concerted move in this direction will be some time in coming because of the economics. Refiners feel it's bad enough to have to upgrade a naphtha by reforming without any increase in yield, but having to upgrade a product which already has been upgraded once by cat cracking is like adding economic insult to injury.

Nevertheless, the refiner is faced with having to take some kind of action. How he adapts his particular conditions to face the situation will vary, but generally, there'll be some changes made.

As one major sums it up: "Whether we like it or not, from a customer's standpoint we're going to have to manufacture gasolines with low sensitivities. The move is already in that direction."

TWO MEN can handle deflated fabric seal . . .

SEAL goes inside tank where it floats on products.

Fabric Seal Cuts Evaporation Losses Sharply

A NEW coated-fabric vapor seal gives promise of reducing evaporation losses from gasoline storage tanks by more than 90%.

Esso Standard Oil Co. has made two tests of the seal. They indicated potential evaporation reductions ranging from 90 to 93%.

In one test, a seal was installed in a tank used for gasoline storage. A nearby tank had no seal. After several months' service, the tanks yielded vapor samples showing:

. . . 1.4% average hydrocarbon content in vapor space of tank with the seal.

. . . 22% in the other.

This indicated a potential evaporation reductior of more than 90% through use of the seal.

Esso also reported the seal showed no deterioration and appeared in the same condition as when installed.

Another of the seals, installed in Pennsylvania in a typical, small gasoline bulk tank, reportedly reduced vapor loss by about 93%. Before the seal was installed, about 663 gal. per month were lost in evaporation over a year's period. Average losses in the year following installation of the seal were 49 gal. per month.

The floating-type seal is fabricated from a material coated with modified polyester resin. The coating may be applied to nylon, dacron, glass cloth, or other fabrics to provide desirable burst and tear-strength properties.

The coated fabric is manufactured by the Irvington Division of Minnesota Mining & Manufacturing Co. Plastic Creator's, Inc., New Jersey, fabricates the Mayflower Vapor Seal from this material.

Exceptional abrasive, chemical, and solvent-resistant properties are claimed for the seal. It is unaffected by jet fuels, synthetic ester oils, and hydraulic liquids.

Flexibility is permanent, since it contains no plasticizers which could bleed out with age.

Installation . . . The seal consists of a doughnut-shaped ring made to the size of the tank in which the seal is to be installed.

Across the hole in the doughnut is a membrane of the same material. Around the outside edge of the doughnut is a foam-filled wiper ring which makes snug contact with the tank wall when the doughnut is inflated with air.

This one-piece assembly is lowered like a rope into the tank as it comes from the shipping carton. After inflation, the air cell forms a raft floating on the surface of the product in the tank. The center membrane is fitted with a gaging well and a sleeve for an anchor cable which passes through the raft to prevent rotation and keep the gaging well under the manhole.

Esso reported that two men easily handled the seal-installation job in their test tank. They required only about 45 minutes. Seals of 15 to 20-ft. diameter weighing 100 to 200 lb. can be installed by three men in 1 to 2 hours.

Big South Kentucky Strike Flows 792 Bbl.

- **Discovery flowing from 497 ft. North offset is being started.**

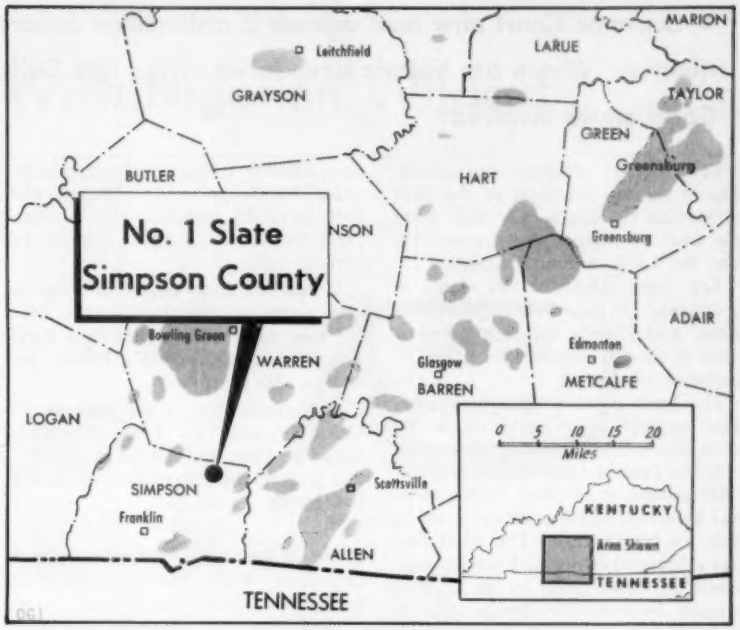
KENTUCKY'S shallow oil play has come up with another big discovery.

This time it is Silurian production which flowed 792 bbl. of 44°-gravity oil through a ¾-in. choke on the first full 24-hour test. The discovery is flowing from just above total depth of 497 ft.

The discovery, the Linehan & Stoltenberg-Amtexas Oil Corp. 1 Slate in Simpson County, blew out after the drill hit 497 ft. Oil and gas flowed out of control for 5 hours.

Location is 2 miles southwest of the Stringer Middle Silurian field in the extreme southern part of the state. It lies on the northern edge of the Nashville Dome. There had been no drilling here for many years although this section of the state is one of the oldest producing areas in the nation. The discovery is about 70 miles southwest of Kentucky's big oil play in Green County (OGJ, Sept. 21, p. 106).

Drilling is to begin at once by the same operators at a north offset to the field opener. Charles N. Linehan and H. W. Stoltenberg are principals in the newly-opened, joint-operating firm in Midland, Tex. Amtexas Oil Corp., is an operating subsidiary of the William K. Warren Foundation. John W. Glahn and Max M. Crunk, Jr., are the executives of Amtexas Oil Corp.



PROCESSING BRIEFS . . .

A new gas products plant, designed to process 50 million cubic feet of gas daily, from the May and South May fields, has been placed on stream by Arkansas Fuel Oil Corp., operator with an 80% interest. It is 15 miles south of Kingsville, Kleberg County, Texas. Other owners are Sun Oil Co., J. Ray McDermott & Co., Herman F. Heep, Mokeen Oil Co., Renwar Oil Corp., and Champlin Oil & Refining Co. Delta Engineering Corp., Houston, was contractor. The plant currently is processing 34 million cubic feet of gas daily and 29,000 gal. of natural-gas liquids are being recovered.

An 8,000-bbl.-daily distillate desulfurization unit has gone on stream at British American's Clarkson, Ont., refinery. The unit is designed to remove 90% of the sulfur content in three charge stocks: Fluid catalytic cracking light cycle oil, stove oil, and diesel fuel. Hydrogen will be supplied from reformer gas, and pelletized cobalt moly catalyst will be used. The addition of a second reactor equipped with its own separator and fractionator system will enable the unit to handle either two distinct feedstocks or double any one feedstock.

Stockholders have approved the sale of Texas Calgary Co. to Textar Corp. The deal will give Textar its first refinery, a 3,000-bbl. plant at Carizzo Springs, Tex. Textar exchanged one share of its stock for every eight shares of Texas Calgary.

A company to manufacture and market additives for petroleum products has been formed in Belgium. Jointly owned by Amoco Chemicals Corp. and Petrofina, the new firm is Amoco Fina, S. A. Construction of a plant will start soon in Antwerp with production scheduled for early 1961.

Consolidated Mining & Smelting Co. of Canada, Ltd., will build a 100 tons per day urea plant at Calgary. The plant will employ the Inventa-Vulcan urea process with facilities for total recycle of ammonia off-gas. The project, to be completed in 10 months, will be integrated with other nitrogen products operations at the site.

Also for Refiners . . .

IN THE NEWS: A new market for refiners lies in use of oil to spray bridges (p. 85) . . . Fair trading of gasoline has both good and bad aspects, survey shows (p. 94) . . . Refiners have tough problem in cutting down on sensitivity and at same time keeping up in octane parade (p. 98) . . . New fabric seal cuts evaporation losses from gasoline storage tanks (p. 100).

PLUS THIS TECHNICAL REPORT: Humble attacks pollution at Baytown (p. 172).

Tidelands Fight Goes to High Court This Week

- **Supreme Court now must answer a multimillion-dollar question: Where are historic boundaries of the five Gulf Coast states involved?**

THE LONG struggle over ownership of oil-rich tidelands of the Gulf of Mexico reaches a new high point this week in final oral arguments before the U. S. Supreme Court.

Top legal talent in the states of Louisiana, Texas, Mississippi, Alabama, and Florida will marshal their cases to counter arguments of the Department of Justice.

The basic point at issue is whether state control of mineral rights extends seaward by 3 miles or 3 leagues.

In the case of Louisiana, more than $208 million is at stake immediately, and hundreds of millions more are at stake in future years. The $208 million represents bonus and royalty payments on leased areas in the Gulf of Mexico between the 3-mile and 3-league lines.

Texas has about $30 million tied up in the case, and millions more in future payments are involved.

The states of Mississippi, Alabama, and Florida also are participating, but have yet to find any offshore production, although some bonus money is involved.

Procedure . . . The court has set aside 13 hours of formal arguments to extend over Monday, Tuesday, and Wednesday of this week.

The five states jointly will present common points for 2 hours. Louisiana, Texas, and Florida will each have another 1 hour to argue its case, while Mississippi and Alabama will each have 45 minutes. The Government will have an equal amount of time to reply.

Unless the court orders briefing on new points of law, it will then take the case under advisement and hand down its ruling, possibly before the end of the year.

Louisiana's Atty. Gen. Jack P. F. Gremilion and two Texas attorneys, James P. Hart and Chrys Dougherty, will present the common case for the five states.

Points of law . . . It will be the job of Gremilion, Hart, and Dougherty to deflate the Justice Department's contention that the national boundary always has been 3 miles beyond the shoreline.

The states will argue that:

. . . The Gulf states, where their constitutions say it, have a coast extending 3 leagues seaward, and Congress has recognized the Gulf as an area of special geological and historic consideration.

. . . The Submerged Lands Act of 1953 recognizes the Gulf Coast to be different from other coastal areas because of old treaties which established the 3-league boundary.

. . . Neither foreign policy nor international law prohibits a 3-league boundary and, in fact, recognizes it.

The attorneys in the case have coordinated their arguments well in advance of the hearing in Washington. Gremilion and his aides went to Austin, Tex., September 30 for conferences with the Texas attorneys, and all the attorneys in the case scheduled a meeting last weekend in Washington to correlate their plans prior to the hearing.

Case history . . . The oral arguments this week are taking place just 1 year later than originally scheduled.

They had been set for October 13, 1958, but were delayed indefinitely and reset for the current date.

The struggle over offshore control began, however, many years ago. When the first important oil and gas wells came in after World War II, the court ruled against Texas, Louisiana, and California in boundary cases and held that federal rights "transcended" those of the states.

But passage of the 1953 Submerged Lands Act threw the issue back into the courts. The law said that states should control submerged lands within their historic boundaries as they existed when the states entered the union. Anything beyond these historic boundaries would go to the federal Government.

The issue then became: What are the historic boundaries of the states involved?

Separate cases moved toward the Supreme Court, and finally the court ordered all of them to be combined into a single action, although the final ruling may be different for different states.

Panhandle Wins Fight to Abandon Service

PANHANDLE Eastern Pipe Line Co. has won, at least temporarily, its long fight to abandon service to Michigan Consolidated Gas Co. of Detroit.

The Court of Appeals for the District of Columbia has lifted a stay it had ordered earlier to prevent abandonment of the service, thus freeing Panhandle to divert to its other customers the gas it had been supplying to Michigan Consolidated, one of Panhandle's competitors in the Great Lakes area.

The court, in dissolving the stay, pointed out that its consideration of the case is still in progress and that, until final decision is made, any actions by the companies involved would be at their own risk.

Panhandle Eastern, apparently willing to take that risk, immediately switched its supplies to customers who had been seeking more gas. These included, largely, utility companies in Indiana, Michigan, Ohio, Illinois and Missouri.

The amount of gas involved in the dispute between Panhandle Eastern and Michigan Consolidated was 127 million cubic feet daily.

The Federal Power Commission earlier had authorized abandonment of service, but Michigan Consolidated took the issue to court and in August the court granted a stay until after October 1 oral arguments. This stay has now been ended.

The contract between the two firms had expired in 1951, but at that time the FPC ruled that a discontinuance of the service would create hardships.

After American Louisiana Pipe Line Co. went into operation in 1956, Panhandle Eastern asked the FPC to let it abandon the service to Michigan Consolidated since both American Louisiana and Michigan Consolidated are subsidiaries of American Natural Gas Co.

Michigan Consolidated fought the request, and legal proceedings have been continuing.

Shell-BP Scores With Nigerian Wildcat

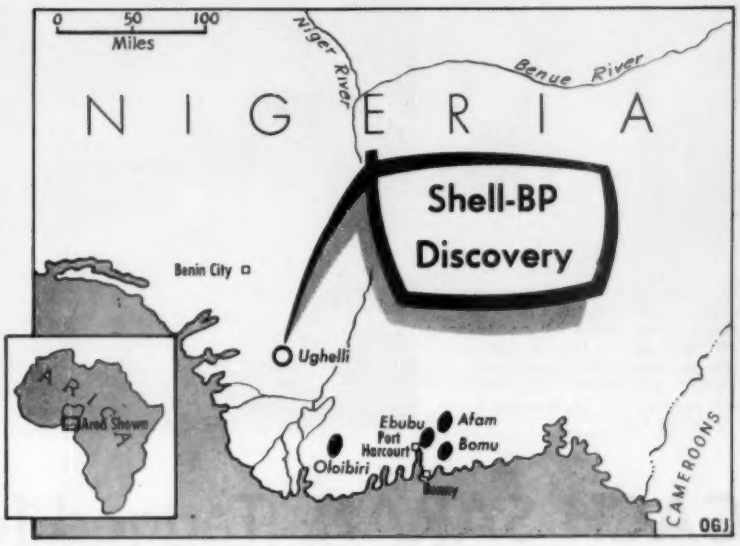
- Discovery was sixth test in 5 years by company in western part of country. Stepout being drilled.

AFTER 5 years of unsuccessful wildcatting in western Nigeria, Shell-BP Development Co. has struck oil "in considerable quantities" at Ughelli.

The find was made on the sixth try west of the Niger River. It is 60 to 70 miles northwest of the nearest other production, at Oloibiri. Spurred by the success, the company is drilling the first stepout on the Nun River, and is preparing several other locations for wildcats in the same region.

The western discovery came as preparations were getting under way for an ocean terminal at Bonny Island, at the mouth of Bonny River. This will handle crude from fields already on production in eastern Nigeria.

Shell-BP has found oil in at least a dozen wells in 20 years of exploration. But the finds have often been disappointing one-well fields, and the field potentials have been difficult to judge on the basis of test production.



Four of the fields, Oloibiri, Afam, Ebubu, and Bomu, currently produce 12,000 bbl. daily, which is carried by pipelines to Port Harcourt. This system will be linked to Bonny Island.

A drilling barge has found oil in two locations in the Niger Delta, at Krakama and Ekulama. It is now drilling its second wildcat at Bonny Island. The first was a dry hole.

Miscible Phase Moving Into Middle East

- Aramco puts stamp of approval on $8-million project—probably world's largest—for 'Ain Dar section of prolific Ghawar field.

MISCIBLE-phase displacement—fast coming of age as an oil-recovery tool—is due to make its debut outside the U. S. following a vote of confidence by Arabian American Oil Co.

Aramco has approved probably the world's biggest such program—an $8-million project to inject about 37,000 bbl. of raw LPG daily into the north dome of 'Ain Dar section of Ghawar field. The project is scheduled for completion June 1, 1961.

Ghawar is one of the most prolific fields in the Middle East. The miscible-phase projects in the U. S. were designed for much smaller reservoirs. 'Ain Dar produces more than 250,000 bbl. daily. Ghawar, as a whole, produces more than 600,000 bbl. daily.

Under the program, LPG will be mixed with a high pressure gas stream from a new gas-injection plant at 'Ain Dar and sent into formation as an enriched gas drive.

Approval was made following studies started last year to determine what share of unused, hydrocarbon-rich gas from spheroids could be used to increase ultimate recovery from the Ghawar-'Ain Dar area.

Armco said that tests demonstrated that higher oil recovery was obtained with this type of miscible-phase system than with gas alone.

What will be done . . . Heart of the program will be a 18,000-hp. compression plant at Abqaiq field.

This will take spheroid gas collected from three 'Ain Dar and one Abqaiq gas-oil separator plants and from the Abqaiq overhead gas stabilizer. The gas will enter the compression plant at a rate of 55 million cubic feet daily.

Gas will be cooled to 120° F. and compressed to 515 psi., at which point essentially all of the gas will become liquid. From Abqaiq the LPG will be pumped to 'Ain Dar, where it will be raised to 2,100 psi. by 1,500-hp. motor-driven pumps before entering the gas stream. The new gas injection plant has a capacity of 210 million cubic feet daily, with a discharge pressure of 2,100 psi. (OGJ, March 16, p. 95).

The compressor plant will be built next to an older gas-injection plant at Abqaiq, and operations will be coordinated. Modifications in existing gas-collecting equipment and gas-oil separators will be relatively minor.

CHECKING the rugged terrain around a drilling location in Iran's Gach Saran field are, left, Paul Swain, the Journal's international editor, and Peter Fairlie, petroleum engineer with Iranian Oil Exploration & Producing Co.

GACH SARAN: Tagged for Bigger Role

SOME OIL MEN believe Gach Saran may contain reserves equal to any field in the world. Gach Saran No. 13 helps support this belief. The day the Journal's editor visited the well, it was producing at the rate of 35,000 bbl. daily.

• This old field in southern Iran has been ignored for years. But now there is a big demand for heavy crude—and Gach Saran has millions of barrels ready for the market.

Paul Swain
International Editor

IRAN has been called a geologist's paradise, and it is, but this can be a mixed blessing.

The thrusts, faults, sharp folds, and outcrops that bring a gleam to a rockhound's eye are enough to give a drilling engineer or a pipeliner a permanent migraine.

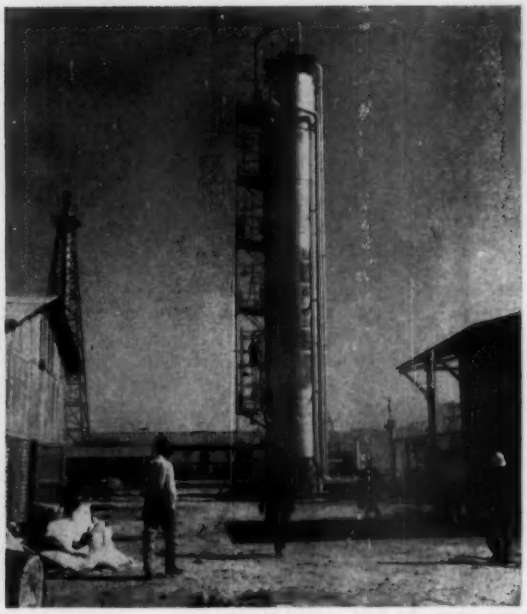
Iran, where the Middle East oil industry was born, is oil country. It's rough oil country. It has been producing for more than 50 years and is the third ranking producer in the area. In spite of the fact that Iran has produced more than 3.5 billion barrels of crude, is hasn't even been scratched yet.

With its older fields like Masjid-i-Sulaiman, Haft Kel, and Naft Safid still producing respectable amounts of oil, and big Agha Jari still expanding, the international consortium has been able to build Iran's oil industry steadily, slowly, but systematically. Wildcatting to test some of the literally hundreds of known but untested structures is only half the building program.

The other half, a development drilling program, is pretty largely being centered in a field that is more than 30 years old—Gach Saran.

Gach Saran was discovered in 1928, but only four

PROLIFIC production from Gach Saran wells are handled by big horizontal separators at the field's two production stations.



WORKMEN are putting the finishing touches on a 75,000-bbl. H_2S stripping tower at No. 1 production station.

in the Middle East Oil Picture

wells were drilled on the big structure, the southernmost of all of Iran's fields. Gach Saran's 32°-gravity crude is the heaviest produced in Iran and this heavy oil was the ugly duckling of all the country's production for years. As recently as 4 years ago, three of Gach Saran's wells were shut in and the fourth produced only a token amount of crude.

This is all changed. Now that heavier crudes are not as lightly regarded as they were at one time, Gach Saran has as promising a future as any field in Iran. Three rigs are now running at Gach Saran (more than at any other single area in the country) and last year eight producers in the field poured an average of 59,000 bbl. daily into the 12-in. pipeline to Abadan. This is only the beginning for Gach Saran.

There are those who believe Gach Saran may possibly contain reserves equal to any field in the world. The physical facts easily support such a belief.

The Gach Saran structure is at least 30 miles long and 5 miles wide. Iran's prolific Asmari limestone is thicker at Gach Saran than in any field in the country. The Asmari reservoir averages 1,550 ft. at Gach Saran and the 7,200 ft. of oil column in the field is enough to make any reservoir engineer blink.

The structure lies in country as rugged as any in mountainous Iran.

The development . . . With three rigs running in the field development program, construction engineers are working just about as hard as the drilling crews to put up facilities to handle the production that will be forthcoming.

The No. 1 production station is spotted on a small 100-yd. square plateau atop a rugged peak that overlooks the field. The country below is so broken and rugged that even from this 2,970-ft. height only one well is visible. Separation capacity of this station is being increased from 60,000 bbl. daily to 140,000 bbl. daily.

A 110-ft., 75,000-bbl. daily H_2S stripping tower was hauled piecemeal up a tortuous climbing road to the peak and assembled on the spot by M. W. Kellogg. Production from the station now goes into the 12-in. Abadan line, but as soon as the 26-28-in. line across the mountains to the new Kharg Island terminal is completed, the stabilized crude will go into the larger line.

The No. 2 production station, 5 miles to the north, is being equipped with two groups of four massive horizontal separators for parallel 4-stage separation. Then, the crude will move into a pair of 75,000-bbl. daily H_2S strippers and into the big pipeline by gravity flow.

The stripping towers at both production stations are designed to reduce the H_2S content of Gach Saran crude from .024 to .007.

The third and fourth stations will be added later. The two additional production stations will make pumping the pipeline necessary. Until they are added, the crude will be sent to Kharg Island by gravity flow. Average elevation at Gach Saran is 2,550 ft. It's only 200 ft. at the Kharg Island tank farm, 99 mountainous miles southwest.

Initial capacity of the production stations and the pipeline will be 337,000 bbl. daily—all from a handful of wells so widely spaced in such rugged country that one can't be seen from another.

Reds Start Line

. . . which will feed crude oil to satellites in Europe. Refineries are planned.

WORK has started on a major pipeline system from Russia into Eastern Europe.

The 2,500-mile big-inch line will be built in 4 years and supply the entire crude needs for East Germany, Poland, Czechoslovakia, and Hungary. Specific dimensions or capacity have not been revealed, but the system is expected to deliver about 300,000 bbl. daily.

The system, to be known as Vomecon Pipeline, is being built by the Eastern Block Council for Mutual Economic Aid. Each country will build and pay for the section of line within its own borders.

Czechoslovakia kicked off the project when the first spread started moving westward from the Russian frontier. All special pipeline equipment, especially pumping stations, will be Russian-made. Czech engineers, builders, and specialists have been training for their jobs for months, presumably in Russia. The Czech section of the line is expected to be completed in 1½ years.

The system will originate at Kuybyshev, on the Volga river, where it will pick up crude produced in the vicinity from Russia's second Baku. It will run eastward as a single line to the Dnieper river, where it will split into two branches.

Refineries planned . . . The northern branch will extend to Plock, Poland, and on to Schwedt, East Germany. Refineries with initial capacities of 40,000 bbl. daily have been planned for both cities. These are to be doubled in size later.

The southern branch is expected to feed refineries at Bratislava, Brno, Pardubice, Kolin, and Kralupy. A branch from this line is expected to be built to Budapest, Hungary, for a proposed 20,000-bbl. plant.

Iraq Seeks Crude Bids

THE Iraq government apparently is getting some nibbles on its offer to sell royalty crude in world markets. The deadline for bids was extended a month, reportedly because of a large number of offers to buy and inquiries received from Western and Soviet bloc countries.

Iraq has been using the hard sell in an effort to dispose of its royalty crude directly. Advertisements were placed in Europe's biggest newspapers, and Iraq embassies and legations abroad have been striving to stir up potential sales directly.

The government is entitled to sell 12½% of domestic production, or any fraction, anywhere it wishes in world markets. Next year's royalty crude, which is now being offered for sale, will amount to an estimated 116,000 bbl. daily.

Puerto Rico Test

. . . is scheduled by Kewanee and Houston independent.

PUERTO RICO is going to get its first oil test.

A rig of Kewanee Oil Co. will move from Cuba to Puerto Rico this month and spud on a 200,000-acre concession held by David L. Gordon, Houston independent.

Kewanee and Gordon are participating jointly in the venture, with Kewanee the operator.

The well will test the island's Tertiary age sediments to a depth of about 7,000 ft. Spudding will occur late this month or early November.

The Gordon concession is located in south central Puerto Rico and includes both offshore and onshore acreage.

Gordon acquired the concession in early 1958 after the Puerto Rican Commonwealth revised its concession law to attract oil prospectors (OGJ, April 21, 1958, p. 109).

The proposed well will be located near the coast, about 30 miles east of Ponce near Santa Isabel.

Gordon is president of Maritime Oil Co., but said he is associated in the Puerto Rico deal as an individual.

Chilean Fields to Produce

OIL FIELDS on the extreme southern tip of the Chilean mainland will go into commercial production next spring.

The government's Empresa Nacional de Petroleo has started construction of a 35-mile 8-in. pipeline outlet from fields in the Punta Delgada area of Magallanes Province. The fields, now being developed, are Delgada Este, Faro Este, and Delgada.

The pipeline is expected to be completed in March. At that time the new fields may be ready to produce from 4,000 bbl. to 5,000 bbl. daily. The shipping terminal will be located at San Gregorio, 80 miles northeast of Punta Arenas, where sea-loading facilities are being built.

Line Reaches Paris

. . . from Lacq gas field as system nears completion.

FINISHING touches are being made on one of the two most important natural-gas systems in Western Europe.

The trunk line from Lacq field in southwestern France has reached Paris. When connections now being made are completed, trunk lines of a 1,550-mile system will be finished. Only northern Italy, where a 3,100-mile system delivers natural gas to users in the Po Valley, has a more extensive network.

The Paris line has been on the home stretch since the final river crossing at the Seine. One of the French capital's power stations already is hooked into the system.

Work was started 2 years ago on a network to southwestern and central France, and to Paris. Deliveries are expected to reach 470 million cubic feet daily by 1961. The volume of gas will be further increased as branch lines are completed to smaller cities near the main lines. Many branches are under study, and some are already under construction.

Two affiliated companies market Lacq gas. Ste. Nationale des Gaz du Sud-Ouest is owned by S.N.P.A., 35%, R.A.P., 35%, and Gaz de France, 30%. The other marketer, Cie Francaise du Methane (CEFEM), is owned jointly by S.N.P.A. and Gaz de France.

By 1961, heavy industry is expected to take 212 million cubic feet daily for use both as fuel and a raw material. Another 155 million cubic feet daily will be used to produce electricity, which in turn will be used to produce aluminum. The remaining 103 million cubic feet will be taken by Gaz de France.

Trinidad Plant Expanding

TEXACO has started work on increasing the capacity of the Pointe-a-Pierre, Trinidad, refinery from 135,000 to 235,000 bbl. per day.

New units will include 100,000-bbl. topping unit, 15,000-bbl. catalytic reformer, and 20,000-bbl. hydrotreater. Tanker-loading berth will be added to accommodate company's new 46,000-ton tankers.

Project, due for completion in late 1960, will be done by Caribbean Bechtel. Design for the refining units was done by Fluor.

How to get the MOST out of your

Surface Mud System

BY ED McGHEE
Drilling Editor

YOU PAY THE PRICE of a good surface mud system whether you have one or not.

A poor system costs the contractor in time—time for too-frequent cleaning of tanks and pits, time for rigging to switch mud flow, time for avoidable mud mixing and conditioning. It can also cost the contractor in pump-maintenance expense, moving expense, and even in purchase price. The poor system costs the operator, too. It can cost him in wasted mud materials, in mud jetted away unnecessarily, and in lost day-work time on the rig.

Since both contractor and operator pay for a good surface mud system, they should both see that they are getting it.

Of course, the time to make certain you have the best surface mud system is when you first purchase the equipment. Here are some things to watch for:

- Are substructure, tanks, and shaker of proper height that return mud will flow by gravity without having to excavate for tanks, pumps?
- Will the shale shaker remove all solids possible without too-frequent changes of screen? Will screen changes be easy?
- If the muds are heavily treated, will steel mud tanks be used? Are you getting enough? Too many? Are they too small? Too large?
- Would a centrifugal mud-mixing pump be better than a duplex pump? Could you save by getting motor-driven mixers and agitators?
- Is the pump suction designed so that you can run the pump as fast as necessary without knocking?
- Would mud-pump maintenance be cheaper if a desander were used?
- Can mud materials be stored and handled without excess waste?

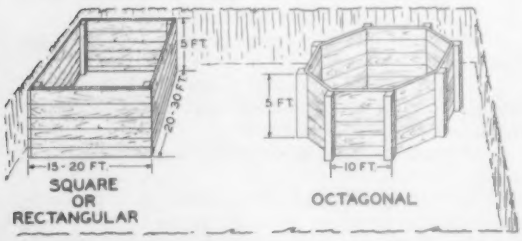
Watch while operating . . . Even a well-planned system must be watched to make sure that it is operating most cheaply. Some of the important things are:

- Are shale-shaker screens properly installed for longest life?
- Is mud flow through the tanks even? Or is flow channeling so that gas and sand don't separate out and are carried to the pump suction?
- Is stuffing box on centrifugal pump properly lubricated for longest life?
- Are pump suctions and discharges kept short, free of sharp bends?
- Can dangerous mud materials be mixed without injury?

Pits and tanks

LOW COST and low elevation make dug pits attractive. However, the dirt may contaminate the mud, or the mud may be lost into porous soil. Fig. 1.

THESE EARTHEN PITS for a Gulf Coast steam rig show how easily flow may be rerouted, a more difficult feat with steel tanks. Fig. 2.



IN SOIL WHICH SLOUGHS BADLY, earthen pits can be lined with rough lumber. Corner posts are 6 by 8 in. and planks are 2 by 12 in. Shape may be square, rectangular, or octagonal. Fig. 3.

MOST OF TODAY'S shallow wells and many of the deeper wells are still drilled using mud which is stored in pits dug out of the ground. Such pits have many good points: They are cheap to make, they need not be moved, a pit can be bypassed easily, and their low elevation insures that mud will flow by gravity throughout the system. Figs. 1 and 2 show these features.

There are almost as many different dimensions for dug pits as there are drilling rigs. But for drilling to 10,000 ft., they might be 15 ft. wide, 5 ft. deep, and 30 to 40 ft. long. The ditch between the pits is narrow and shallow so that cuttings are not carried from the settling pit to the suction pit and so that the settling pit can be bypassed, jetted out, and settlings removed.

If the soil at the well site is loose and sloughs badly, the pits may be cribbed with rough lumber as in Fig. 3. Cost of digging and lining a pit to hold 400 to 500 bbl. is about $400. In some cases, operators spread a thin layer of dry cement over the bottom of the pit to cut down on seepage of mud into the ground.

A primary purpose of such pits (or any others) is to settle out the sand and silt that is not screened out of the mud as it returns from the well. The pits also allow time for the escape of gas or air that is entrained in the mud. In addition, the pits are a place where mud can be mixed, where surges in pump suction can be compensated for, and where a mud supply can be stored in case of lost circulation.

Pits or tanks? . . . Dug pits are not without problems. While they don't have to be moved, they do have to be covered up after drilling is completed. They lose mud to the earth and they are difficult to clean out. Mud in the pits can be contaminated by blowing dirt, by clays in the ground, and by runoff water. Trash and roots in dug pits very often foul the pump suction screen and cause lost time in cleaning the screen and pump-suction valves. Mud guns easily cut away the sides of the pit. In addition, it is quite difficult to calculate the volume of mud in a dug pit; this creates a tendency to carry too much mud on the surface. Priming of pumps which take suction on dug pits is a time-consuming chore.

These foregoing points are problems at any time but they are especially bad when the mud is heavily treated and expensive. Then, it is almost always cheaper to use steel mud tanks.

It is true that steel tanks are expensive to buy and to move. Sometimes, when steel tanks are used on rigs with low substructures, they must be set down into a dug trench so that mud will flow from the wellhead into them. Moreover, it is quite often difficult to bypass a tank. If the earth is soft, the tanks must be set on matting. And if mud guns are left unattended long enough, they may cut holes into the steel bottom.

Knowing all this, many contractors don't want to make the capital investment in tanks since tanks may be rented when needed.

Tanks usually best . . . Still, with heavily treated muds, steel tanks generally make a big saving both to contractor and operator by conserving time and preventing mud waste. Mud in steel tanks is not contaminated by surface trash nor does it seep away into the ground. Steel tanks are easily covered to keep out rain. The pump suction is flooded so that pump priming is no problem.

. . . their important features

Steel tanks are easier cleaned and all mud volume in them is usable. As Fig. 4 shows, tank volume is easily measured; this means that fillup volume during trips can be figured easily so that potential kicks can be detected. Moreover, easy measurement means less tendency to carry an excess of mud.

Because of these advantages, most deep-well rigs are fitted with steel tanks; so are many lighter rigs. Many workover rigs have steel tanks because they use oil or salt water as workover fluids.

Two tanks or three? . . . The size of mud tanks has little to do with the volume of mud needed on the rig. For instance, almost all tanks are either 5 or 6 ft. tall. Some rigs have tall enough substructures that mud will flow by gravity out of the flowline into a shale shaker on a 6-ft. tank. Generally, these rigs use tanks 6 ft. in height. Rigs with lower substructure use 5-ft. tanks.

Only 2 or 3% of all rig tanks have a length different from the almost-standard 30 ft. Reason is that almost all oil-field trailer "floats" are 28 or 30 ft. in length. And a 30-ft. tank is about as long as can be hauled on the common trailers without too much overhang.

Since mud tanks must be hauled over the highway, they are seldom wider than the highway limit. Thus, a width of 7½ ft. is almost universal inside the United States; some rigs outside the U. S. have used widths up to 10 ft.

Thus, in effect, a rig usually has only two choices in mud-tank sizes: a 7½ by 6 by 30 ft.; or a 7½ by 5 by 30-ft.

Some drilling requires more mud at the surface than others. Thus, since the contractor can't vary his tank sizes, he can vary only the number of tanks. Only rigs doing workovers and the lightest of drilling can get by with one tank. Most shallow rigs and some deep rigs do well with two tanks. Most deep rigs use three tanks; and some extremely deep holes have been drilled with four or five tanks on location. So, the question usually is whether to use two tanks or three.

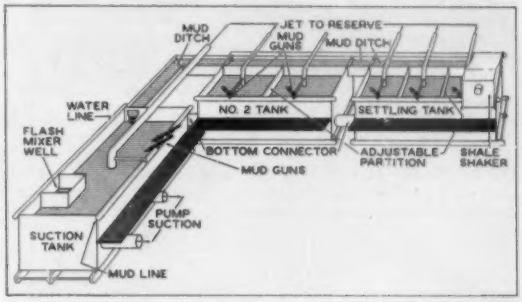
The choice between using two tanks or three depends, of course, on how much mud is needed at the surface. Fig. 5 shows a three-tank layout used by many for medium-depth and deep drilling. Fig. 6 is a frequently used two-tank layout.

Less surface mud or more? . . . The amount of mud that should be carried at the surface (and the tanks to put it in) depends on so many things that there is not even a good general rule of thumb about it. But, generally, all the following things encourage having greater tank capacity:

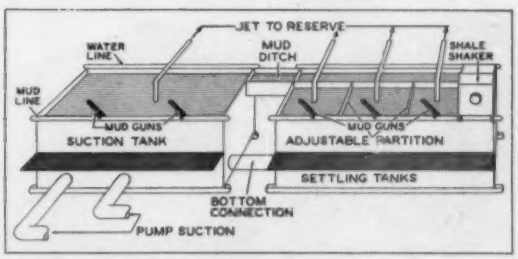
1. If lost circulation is likely, extra volume in the tanks may prevent time lost in mud mixing.
2. The larger the volume in the hole, the more is needed at the surface.
3. The longer time between rig moves, the cheaper large tank capacity is.
4. The larger the volume in the pits, the better solids will settle out, the better gas can break out, and the more the mud can cool off.
5. If well location makes delivery of mud materials slow and uncertain, a large volume at the surface is a safeguard against excessive down time.

There are, of course, good reasons for using a smaller number of tanks with a smaller volume of mud.

VOLUME OF TANKS is easily measured, thus simplifying mud calculations. This tank is marked on the side with weld metal to show volume and barrels per foot of depth. Fig. 4.



COMMONLY USED three-tank system for medium and deep drilling. Motor-driven agitators, desanders, and the like may be added. Tanks are connected top and bottom. Mud ditch makes it possible to bypass tanks. Fig. 5.



NO GOOD GENERAL RULES exist about how many tanks should be used. This is a two-tank system used by many shallow and medium-depth rigs. Fig. 6.

RIG SIDE of most tanks has a mud line running lengthwise along the top; a water line occupies the same position on the opposite side. Mud guns connect to the tank's mud line. Fig. 7.

ROUNDED BOTTOMS make mud tanks easier to clean but also add to the cost. Other styles use flat bottoms, some are level, and some are sloped to one side. Fig. 8.

MUD DITCH along sides of steel tanks makes it easier to bypass a tank. Weir gates are opened and closed to route mud. Fig. 9.

1. The more mud tanks used, the more expensive they are to buy and move.

2. On small rigs where time is cheaper, moves are frequent, and the mud used can be mixed quickly, time lost in making new mud may be less costly than using more tanks to carry more mud volume.

3. The larger the volume of mud at the surface, the longer it takes to treat the entire system. Thus, the few tanks there are, the quicker the system may be treated.

4. Many high-priced drilling barges manage well with less mud capacity than is generally thought necessary on land rigs doing similar drilling. Many new rigs being sent outside the U. S. use only two mud tanks where similar size rigs in the U. S. use three.

But in the end the drilling contractor purchasing or renting mud tanks has little to go on other than his own experience and that of others in the same area. Quite often the choice between two mud tanks and three tanks is largely a matter of personal preference.

How tanks are built . . . Fig. 7 shows a typical steel mud tank. Usually, tanks are fitted with a walkway along the rig side. This walkway is 24 in. wide, divided in two parts lengthwise, and hinged downward for moving. Also on the rig side of the tank is a mud line which is an integral part of the tank's upper edge. A water line occupies the same place on the opposite side of the tank. Mud guns are attached on the mud line.

The tank rests on three skid beams, these being either 6 or 8-in. H-beams. Bottom of the tank is normally ¼-in. plate steel; sides are usually 3/16-in. plate. The side plates are supported by vertical I-beams, spaced at approximately 5-ft. intervals for normal weight muds and at 3-ft. intervals for extra-heavy muds.

When steel tanks first became common, almost all, like those in Fig. 8, had rounded bottoms to make them easier to clean. The rounded bottom is, of course, more expensive than a flat bottom. Thus many tanks have been built with a flat bottom which slopes to one side. The sloped bottom aids in cleaning but is cheaper than a rounded bottom. Recently, many tanks have flat level bottoms which make them the cheapest construction. Cleanout doors on the end or side of the tank make removing settlings, etc., easier.

In use, the tanks are connected by 12-in. or larger lines. The tank at the shale shaker and the No. 2 tank may be fitted with "ditches" or channels along the inside top of the tank so that the tank can be bypassed easily. Such tanks cost from $2,000 to $2,500, depending on size, compartmenting, and other features.

Operating with steel tanks . . . When rigged up, steel tanks should be leveled with the ground and with each other. If not level or if on different levels, the pits cannot be filled to the top, and a part of the working volume is lost. Moreover, the pump suction should be placed close to the bottom of the suction tank. If not, that part of the tank below the pump connection is lost.

It is good practice to arrange the pits or tanks so that any one of them can be bypassed. Fig. 9 shows a steel mud ditch which permits this. With such an arrangement, any tank can be cleaned without interfering with normal drilling. Also, batch material can be conveniently mixed and pumped in a bypassed tank.

Some operators prefer to be able to take suction on any of the active mud tanks. They do this by manifolding the pump suction. This is not general practice and most contractors see little advantage to it.

Mud tanks will last almost indefinitely if cared for

properly. Most tank damage occurs during moving. Often, someone will attempt to pull the tank around when it is full of mud or when it has been stacked full of rig iron. The result many times is a sprung skid. Trucks frequently back into mud tanks, bending the side plates and reinforcing bars or even gouging holes in the steel.

Occasionally, a tank is damaged in attempting to move it when it has been placed in a dug trench as in Fig. 10. Rains can wash dirt and mud round the base of the tank and stick it so that it is quite difficult to move easily without digging out.

Jetting into reserve . . . On most wells the reserve pit is merely a refuse collector. That is, once fluid is pumped into the reserve pit, it is never returned to the system. However, sometimes it can serve as a mud reclaimer. Mud and water which are jetted away with cuttings can be reclaimed from the reserve pit and used again. Fig. 12 shows a layout for a reserve pit where this may be done conveniently. Bottom of the pit slopes gradually away from the rig down to the far end, and then back to the rig end on the opposite side. There, the fluids can collect in a sump until needed back in the active system.

Such a system can conserve water where it is scarce and expensive. It can clarify water better than the active pits alone. As an example, in the Permian basin and elsewhere, where much drilling is done with water instead of mud, contractors often add a flocculant to the drilling water. They "circulate" through the reserve pit. Doing this, they find, removes suspended solids much better than when using only the active mud tanks. Or, some Gulf Coast operators salvage barite by processing mud from the reserve pit through a centrifuge.

Of course, the reserve pit must also be a refuse collector. It must hold all cuttings removed from the well while drilling plus all the contaminated or excess mud discarded from the active pits. A pump or jet is usually necessary to move fluid to and from the reserve pit.

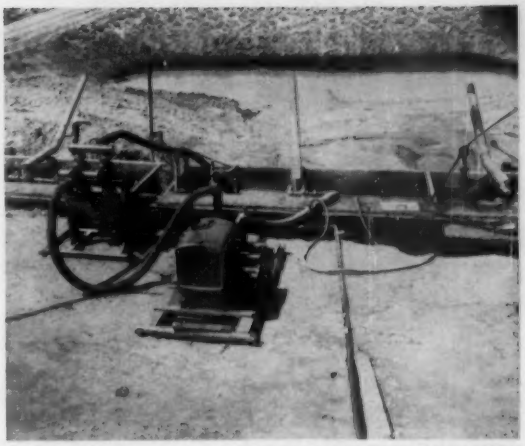
If an oil-emulsion mud is being used, it may be worth while to build a separate compartment or "duck's nest" inside the reserve pit to hold the oil-contaminated fluid and avoid spreading it to the remainder of the fluid in the pit.

Dimensions of the reserve pit depend on the preference of the driller and size depends on the amount of fluid likely to be discarded. A common size for shallow wells is 50 ft. on the side. The earthern walls on the reserve pit for deep wells may be as much as 120 ft. on the sides.

Flowline starts gravity flow . . . Mud returning from the well is carried back to the pits by the "flowline." The flowline is made of a 6-in. or larger pipe connected by a dresser sleeve to the bell nipple atop the wellhead. Ordinarily, the flowline runs straight from the wellhead to the shale shaker. However, it may be run out toward the V-door and be teed back toward the shale shaker if necessary.

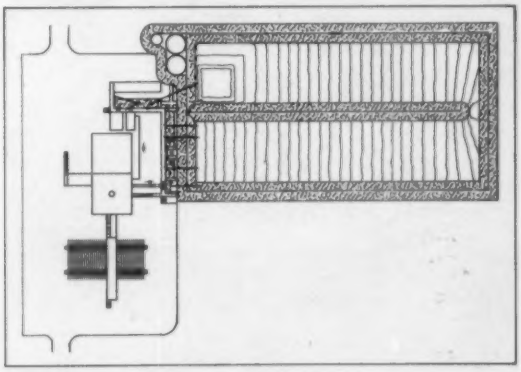
The flowline is the uppermost point in the gravity-flow travel of the mud in the surface system. If derrick substructure and wellhead are high enough and the pits or tanks low enough, it will never be necessary to excavate for the mud tanks.

Size of the flowline depends on the dimensions of the wellhead, substructure, and shale shaker. A diameter of 6 in. is the usual minimum; however, larger diameters are helpful if they fit the space available for them under the derrick floor.



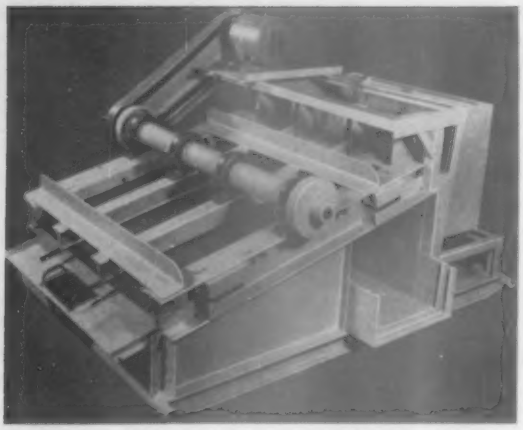
THESE TANKS are set down in dug trenches because rig substructure is too low for gravity flow otherwise. Trench setting is not only more expensive, it can also lead to damage when dirt and mud settlings stick tanks in place. Fig. 10.

RESERVE PITS are usually merely refuse collectors. Size depends on volume of mud to be discarded; dimensions are matter for driller's preference. Fig. 11.



IF FLUIDS are to be reclaimed from the reserve pit, pit should be laid out in this manner, with the bottom sloping away from the rig to the far end, and then back on the opposite side to a sump. Fig. 12.

Mud screens



MOST MUD SCREENS used today are the vibrating type as is this one. Usual drive is explosionproof electric motors. Hydraulic motors are also used as are steam turbines. Fig. 13.

ROTATING MUD SCREENS have advantage of being self-powered. Disadvantage is the fact that much water is needed to keep the screen clean; the water dilutes the mud. Fig. 14.

DUAL MODEL vibrating shakers are often necessary on big rigs which circulate at high rates. This model will handle mud flow up to 1,200 g.p.m. Fig. 15.

MUCH OF THE DIFFICULTY with drilling fluids is a result of the solid particles which become dispersed in the mud while drilling. Fortunately, many of the particles can be stopped from dispersing by removing them while still together in large particles or cuttings.

Screening the large solid particles from the mud is, of course, the job of the shale shaker. The work of the shaker or mud screen is so important that the machines are used on almost all wells—the only exceptions being those very shallow holes where mud is only lightly treated or not at all. On treated muds the shale shaker is bypassed from the mud stream only when lost-circulation material is being added to the system.

Almost all mud screens sold today are the vibrating type shown in Fig. 13. However, in a few shallow-drilling areas, there are still a number of the older, rotating types as shown in Fig. 14. The rotating type had the advantages of low cost, long life, and being self-energized. However, these machines required addition of too much water to the system for use with many of today's high-cost muds. Moreover, the rotating cloth screens were difficult to clean.

The vibrating screen or "shaker" does require outside power. Usually, the power is from a 2 or 3-hp. electric motor or from a hydraulic motor. Steam or gas turbines have also been used. The electric motors should be explosionproof, if used, to prevent the possibility of igniting any oil or gas brought out of the flowline by the mudstream. These motors should be carefully maintained to be sure they remain truly explosionproof.

Purchase price not all . . . The original cost of a single-model shale shaker may run from $1,300 to $2,600. However, there are things other than purchase price to watch for. The machine should have a rigid frame because long screen life depends on the frame being as rigid as possible. In addition, the screens should be easy to change. The machine should not be overly deep from bottom skid to flowline connection.

Shakers vibrate at speeds from 1,750 to 2,000 times per minute. The faster the vibration, the more effective each square foot of screen is, but it is also true that the faster the vibrations are, the faster the screens wear out.

Vibrations come from the action of out-of-balance input shafts or from out-of-balance pulleys attached to the input shafts. Weights which are fixed to the pulleys usually are picked to give 1/16 to 3/32-in. amplitude to the vibrations. Larger weights can be used to cause larger amplitudes.

Most screens used today are 20-mesh.

Many deep-hole rigs have dual-model shakers like that shown in Fig. 15. These have two screens with independent drive for each. The double capacity of dual shakers is often made necessary by the great volumes of mud circulated in modern drilling. Moreover, a screen can be changed out on one side of a dual unit while the other side handles all mud flow.

In operation, shakers should be fitted with a bypass and a water connection. In many areas, they require galvanizing for longer life in corrosive muds.

When screens are changed, the new screen should be carefully secured to be even and tight in the frame. Otherwise, screen life will be shorter than normal.

Desanders

IN MANY AREAS, it is impossible to drill the formations down to 7,000 or 8,000 ft. without the mud becoming loaded with sand. As much as 5% sand is common; from 15 to 25% is not rare. Most drillers find that 2 to 3% sand is too much.

If the excess sand is not removed from the mud, its abrasive action can wear away at all parts of the mud system. Life of pump parts may be cut in half; bits may get only 80% as much footage because bearings wear rapidly and jet nozzles cut out. Sand-laden mud can cause an extra-thick filter cake in the hole, frequently causing stuck casing or drill pipe.

Part of the sand coming from the well is removed at the shale shaker. In some conditions, much sand will settle out in the pits and in special "sand traps." Such sand traps and pit settling are effective in only a few muds, and, too often, the mud arriving at the pump suction is almost as heavy with sand as when it came out of the flowline.

With such sanding problems, the only answer is a centrifugal or cyclone desander such as that shown in Fig. 16. Efficient desanders like this can cut sand content of the mud from 5% down to as low as 0.5% in one pass.

Sand out bottom . . . Fig. 17 is a cross-section of one type of desander. This device depends for its operation on the fact that sand particles are relatively larger than the clay particles and heavier than the water in mud. Thus, as the sand-laden mud is pumped in a swirl around the desander cone, the large, heavy sand particles are thrown outwards. The liquid and lighter clay particles move inward and rise to the top of the cone. Sand particles settle to the bottom where they pass through an orifice and are thrown off and discarded.

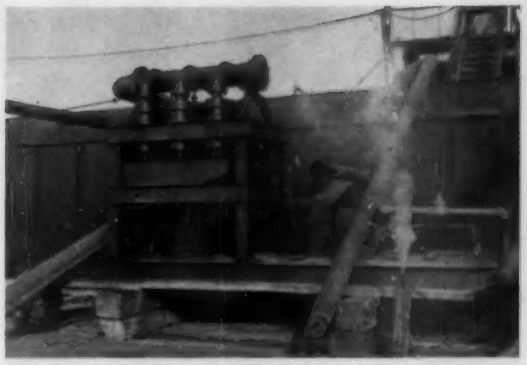
The cyclone desander can remove not only sand from a mud, but barite as well. So, if the mud in use is weighted, the desander can be used only a portion of the time. Fortunately, weighted mud is ordinarily needed only in the deep part of the hole, past the point where most sanding problems have ceased.

Underflow from a desander should contain only sand with a nominal amount of mud. As sand content of the mud is brought low, the size of the underflow orifice can be reduced so that little whole mud is discarded.

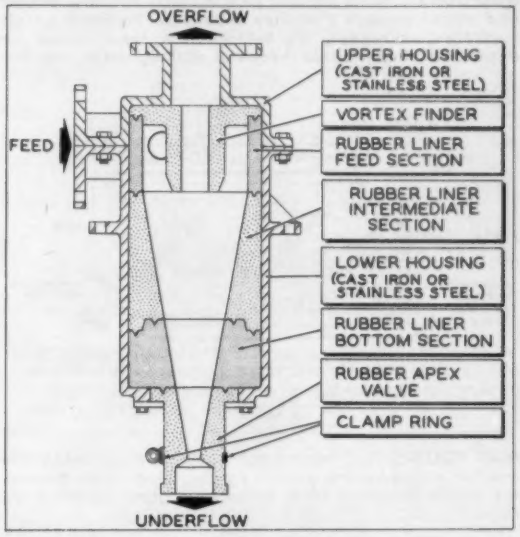
Desand all mud circulated . . . It is best to arrange the desander so that all mud from the well goes through the machine before coming again to the pump suction. Fig. 18 shows one arrangement for doing this. The desander is downstream of the shale shaker and there should always be a positive head on the desander-charging pump. Overflow from the desander returns to the downstream end of the settling pit.

Cost of a six-cone desander along with skid-mounted centrifugal charging pump and 40-hp. prime mover may run as high as $10,000. Some rigups depend on the rig's mud-mixing pump for desander charging; these, naturally, are cheaper. It's important to be sure that the mud-mixing pump can handle enough volume to desand all mud being circulated; many mixing pumps cannot always do this. This is a disadvantage when much sand is being drilled.

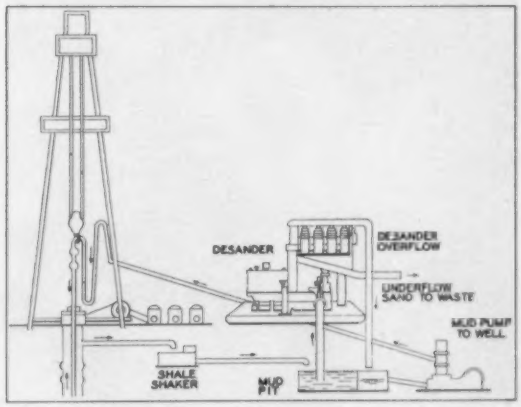
In operation, desanders are relatively trouble-free. The cones have no moving parts and most have replaceable liners which may be changed out quickly.



IN AREAS where shallow hole has many sand beds, desanders such as this pay for themselves in reduced pump wear and longer bit life. Such a machine can cut sand content from 5% down to as low as 0.5% in one pass. Fig. 16.

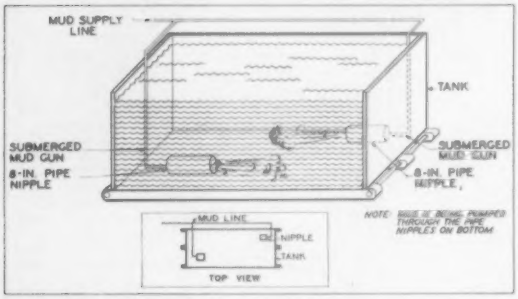


FEED, entering from side of desander cone, is whirled around in cyclone fashion. Heavy sand is slung to outside, rides sides to bottom of cone where it is discharged. Fig. 17.



ONE ARRANGEMENT for desanding all return mud flow. Suction on the desander-charging pump is downstream of the shale shaker; desanded mud returns to the downstream end of the settling tank. Fig. 18.

MUD GUNS such as the one pictured here are low in cost and useful enough that they should be installed on all mudtanks. However, it's seldom that they should be depended on as the sole means of mud agitation. Fig. 19.



MUD ROLLERS, or "bazookas," such as these make the most of a mud-mixing pump's power. Mud jetted through the nipple draws in other mud to get good agitating action. Fig. 20.

MOTOR-DRIVEN AGITATORS should be chosen for satisfactory service in the heaviest mud with which the rig is expected to drill. Often, a popular-size tank will have three 2-hp. agitators or two 5-hp. models. Fig. 21.

Mud agitators and

MANY RIGS use three mud pumps: a main pump; a standby pump which may be the same size as the main pump; and a smaller mud-mixing pump. Investment in the mud-mixing pump and an engine to drive it may be as high as $50,000. Moreover, the mud-mixing pump is expensive to operate.

Very often this mud-mixing pump can be replaced by other equipment to do the same job but which is cheaper to buy and operate. On the one hand, the work of the mud-mixing pump can be done by individual impeller-type agitators and a high-speed mixer. These small motor-driven units can do a more effective job of agitating mud than can a reciprocating pump and mud guns. Moreover, the agitators and mixers are usually cheaper to buy and are always cheaper to operate.

One drilling contractor has estimated that maintaining a 350-hp. mud-mixing pump costs him from $1,800 to $2,400 per year. Individual electric-motor-driven agitators cost him only $50 per year to maintain.

Many new rigs use still another alternative—low-pressure, high-volume centrifugal mud-mixing pumps. Usual arrangement is a 6 by 5-in. (or larger) centrifugal pump mounted with a 50 to 60-hp. prime mover at a spot at ground level near the suction tank. Such centrifugal pumps are cheaper to buy, cheaper to run, and take less space than a conventional duplex pump.

If a rig already has a duplex mud-mixing pump in good order, it may be difficulty economically to justify replacing it with a centrifugal pump or individual agitators. However, if it becomes necessary to make major repairs or replace either the pump or its prime mover, the contractor may be able to save by changing mud-mixing systems.

Agitating with mud guns . . . Mud flow through the pits or tanks must be slow in order to allow time for sand and cuttings to settle out. However, this slow flow may also permit the mud in the tanks to gel; result is that flow channels through the surface system. Good agitation insures that the mud is uniformly treated and that all of it gets the benefit of chemical treatment or lost-circulation additives.

If the mud is weighted, agitation prevents barite from settling out.

Further, more gas can be released from the mud if the pits are agitated than if not. Agitated mud cools off more than does unagitated mud; the cooler the mud is, the easier it is to pump.

Mud-mixing pumps agitate the mud by means of the familiar "mud gun" like that in Fig. 19. These devices depend on a high-velocity jet stream of mud to keep the fluid in the tanks in motion. Unfortunately, mud guns do only a moderately good job of agitating the pits. While they are well worth their low cost even if the tanks are fitted with electrically driven agitators, mud guns should not be depended on as the sole means of agitation except in areas where muds are virtually untreated.

The action of mud guns can be greatly improved by using "mud rollers" or submerged guns sometimes called "bazookas." The mud roller uses a short nipple of 5 to 8-in. pipe on the bottom of the tank. The mud stream jetted through this nipple draws additional mud into the pipe and a full-pipe-diameter stream is discharged. The principle is much like the jet gun for

pumping mud to the reserve pit. Two such bazookas installed off center in opposite ends of the tank as in Fig. 20 will normally roll the entire tank. The two are equivalent to four ordinary mud guns.

The bazookas make the most of a mud-mixing pump but it is doubtful that even these devices can overcome the price advantage of impeller-type agitators.

What size agitators? . . . Most makes and models of motor-driven mud agitators run at about the same speed —from 56 to 68 r.p.m. And, instead of running faster, higher horsepower models simply have impellers of larger diameters. Thus, a 2-hp. model might have an impeller of 28-in. diameter; a 5-hp. model 34 to 39-in. diameter; and a 15-hp. size might have a 48-in. impeller.

Because of their low operating speed, mechanical agitators have little abrasive wear on the agitator parts and on the mud tank. They keep the mud mixed by direct flow of a large-volume, relatively low-velocity stream.

Many rigs have agitators in the suction tank only; on others where the tanks are in series, agitators are used on both suction and No. 2 tank as in Fig. 21. Number and size of the agitators depend on the size of the tank, weight of the mud, etc. Agitators should be selected for the heaviest mud with which the rig is expected to operate so the mud agitator need not be modified for individual locations.

Most popular sizes are 2-hp. and 5-hp. Quite often a tank for medium-weight mud will have three 2-hp. agitators or two 5-hp. models. Dug pits or large tanks on barge rigs are normally handled by single, larger agitators as in Fig. 22.

There is no easy way to calculate just how many and what size agitators are needed to do a proper job on one particular size tank holding one particular kind of mud. In any case, it usually turns out that the agitators need only about 10 to 20% as much horsepower as would a conventional duplex mud-mixing pump.

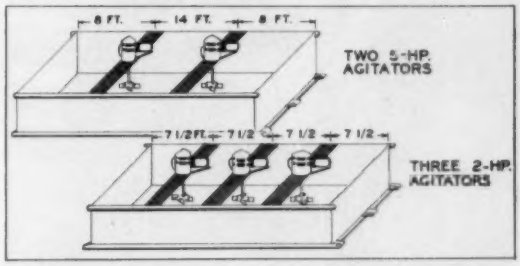
Mud engineers say that the agitators should be capable of turning over the mud in a tank once each minute. Calculating this out gives an answer between 1 and 2 hp. for each 50 bbl. of a medium-weight mud. However, putting this calculation into use is complicated because tanks and pits are not built to take best advantage of agitators and because many different mud weights will be used in the tank during its life.

This means that you must rely on field experience in the area where the agitators will be used and on the advice of the agitator manufacturer.

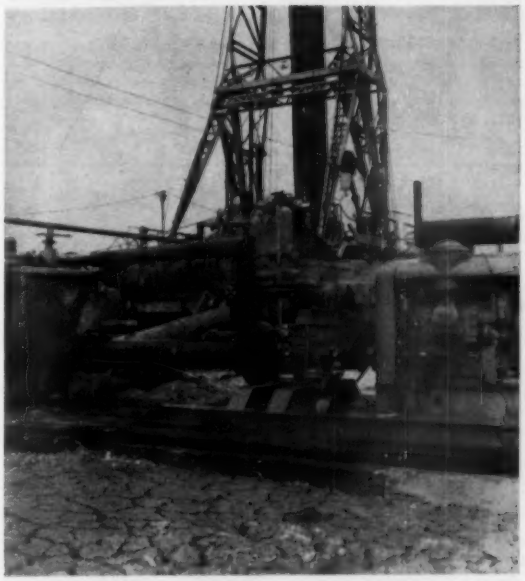
Installing agitators . . . In the common sizes of rectangular tanks, the horsepower of mud agitators is best used if two or more smaller machines are spaced along the length of the tank rather than using a single large machine in the center. On a tank 30 ft. long, 7½ ft. wide, and 6 ft. high, common practice would be either of the following: three 2-hp. agitators with 28-in. impellers, with one at the middle, and one 7½ ft. from each end; or two 5-hp. agitators with 34-in. impellers, 8 ft. from each end. Fig. 23 illustrates this placement.

Many engineers recommend installing the agitator so that the impeller is 2 to 4 in. off the tank bottom. If the tank is deep enough that mud height is more than three times the diameter of the impeller, the agitator likely should have dual impellers.

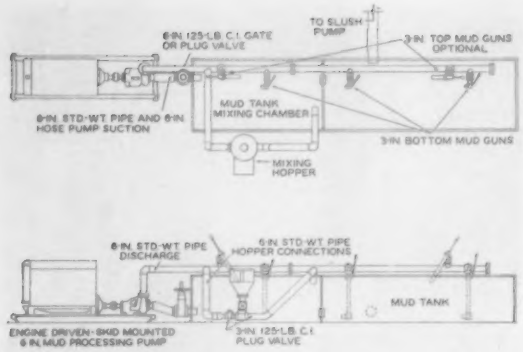
LARGE TANKS or dug pits often have only a single-large-size agitator. All sizes run at about the same speed; extra power is obtained by using larger-diameter impellers. Fig. 22.



ON POPULAR SIZE 30-ft. mud tank, common practice is to have three 2-hp. agitators or two 5-hp. models. Either is more efficient than a single, larger-horsepower model in such a rectangular vessel. Fig. 23.

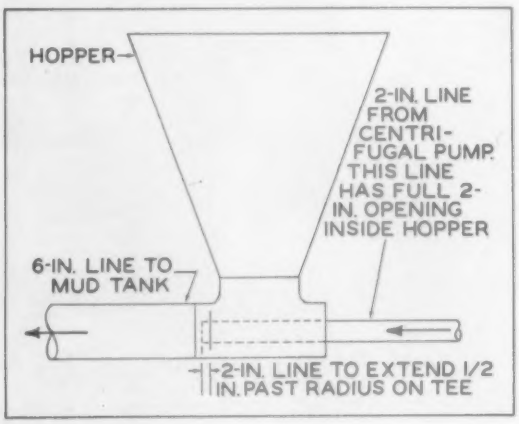


MORE AND MORE NEW RIGS use centrifugal pumps for mud mixing, and agitating instead of a larger, more expensive duplex pump. Pump upkeep is cheaper and cost of lines is less. Fig. 24.


TO SLUSH PUMP
6-IN. 125-LB. C.I. GATE OR PLUG VALVE
3-IN. TOP MUD GUNS OPTIONAL
6-IN. STD-WT. PIPE AND 6-IN. HOSE PUMP SUCTION
MUD TANK MIXING CHAMBER
3-IN. BOTTOM MUD GUNS
MIXING HOPPER
6-IN. STD-WT. PIPE DISCHARGE
6-IN. STD-WT. PIPE HOPPER CONNECTIONS
MUD TANK
ENGINE DRIVEN-SKID MOUNTED 6-IN. MUD PROCESSING PUMP
3-IN. 125-LB. C.I. PLUG VALVE

A WELL-DESIGNED suction and discharge system for a centrifugal mud processing pump. Suction should be short, flooded, and of large diameter. Fig. 25.

THE COMMON MUD HOPPER is a simple, effective, and trouble-free means of adding clay, barite, and other materials into the mud system. It depends on a jet of mud pumped through the bottom to draw mud materials down into the stream. Fig. 26.


HOPPER
2-IN. LINE FROM CENTRIFUGAL PUMP. THIS LINE HAS FULL 2-IN. OPENING INSIDE HOPPER
6-IN. LINE TO MUD TANK
2-IN. LINE TO EXTEND 1/2 IN. PAST RADIUS ON TEE

THIS HOPPER is for use with a centrifugal pump. Notice that both high-pressure and discharge lines are larger than common with duplex mud-mixing pumps. The larger lines keep down back pressure. Fig. 27.

Most agitators and mixers are driven by explosion-proof electric motors; they can be fitted for steam turbines or hydraulic motors if this is desirable.

Today almost all mud-mixing and stirring equipment sits over the tank and drives down into the surface of the mud. Chief benefit of this arrangement is that a top drive needs no seals on the agitator shaft as would a horizontal drive through the side of the tank. Some mud devices, of necessity, have been mounted on the side of mud tanks, driving horizontally through a mud seal. Mud is always an abrasive fluid and the side-entry shafts always wear quickly; seals must be replaced quite often on such drives.

Operating with agitators . . . Even with a well-designed agitator system there may be some stagnant areas in the tank when mud viscosity is extremely high. Some drillers have spotted baffles radially around the agitators in an attempt to reduce the stagnant areas. Others use the standby mud pump and the mud guns to help out when high viscosity cuts agitator efficiency.

Usually drilling mud should be agitated continuously. If the agitator should stand idle for a time, solids in the mud may settle around the impeller and bind it. To prevent damage which might result, the agitator which has been at rest for some time should be freed of settlings by rotating it a few rounds by hand. Or, if there are mud guns in the tank, they may be used to clear the impeller.

With centrifugal mud mixers . . . When a centrifugal pump like that in Fig. 24 is used for mud-mixing and agitating, suction should be as large as possible. The discharge line which usually runs along each tank should be at least 6-in. and preferably 8-in. Bends should be few and large in radius. If these conditions are met, there will be a minimum of back pressure on the pump and it will be possible to use the mud guns and the mixing hopper without difficulty. Fig. 25 shows a well-designed system.

The low-pressure discharge system for a centrifugal pump is cheaper to build than is the high-pressure system for a conventional duplex mud-mixing pump. In addition, one drilling rig found it could maintain a centrifugal pump for only $30 per month where a duplex mud-mixing pump had cost about $15 per day.

Actually, the centrifugal mud pump is quite versatile. It operates the mud guns and mixing hopper just as does the duplex pump. Moreover, the centrifugal pump can be used to charge the suction of the main mud pumps. Or, it can be manifolded to fill the hole during trips and to circulate the kelly while it is in the rathole to prevent freezing in arctic temperatures.

Special mixers needed . . . If the rig has agitators on the tanks, it is possible to mix soaked mud material into the system by dumping it slowly just above the impeller. However, this process isn't satisfactory when there are many sacks of material to be added. Moreover, many materials tend to ball up if added in this way; they often remain balled up through a circulation into the well and are screened out on the shaker. So, in most cases, special mixing equipment is needed.

Most rigs use a mixing hopper like that shown in Fig. 26. It uses a jet-pump principle and operates with mud from the mixing pump or standby pump. Mud is pumped through a nozzle in the bottom of the hopper cone, pulling a vacuum on the hopper. This draws the dry mud material down into the mud stream which carries it into the mud tanks. The hopper is a simple, effective, and trouble-free means of adding clay, barite,

and other granular and flaky materials to the system.

Mud hoppers are sometimes mounted over the tanks. However, this means that the sacked mud material must also be stored at an elevation above the ground. This seldom is really necessary; mud storage and mixing at ground level work quite satisfactorily even when the hopper is as far as 30 ft. away from the suction tank.

Sometimes mud materials tend to clog in the hopper. This is usually due to overfilling and compacting of the material near the bottom of the core. To counteract this tendency, some hoppers are specially made with vibrating devices; however, such devices are not common and the simple hopper continues in use on almost all rigs.

When the mud hopper operates from a centrifugal pump, flow out the bottom of the hopper should be unrestricted so that there is no undue pressure buildup. Both the apex of the hopper and the high-pressure connection must be larger than with a duplex pump. For the centrifugal pump, the hopper "T" should be 6-in.; a 2-in. full-opening line is recommended in place of the high-pressure jet. Fig. 27 shows a good arrangement.

Electric mixers, too . . . On rigs which use no special mud-mixing pump, the standby pump often is not available for mud-mixing when needed. For this reason, many rigs which use individual agitators for the pits also use motor-driven flash mixers like those in Fig. 28 for mud makeup. These resemble the agitators but are smaller and turn much faster—up to 1,150 r.p.m.

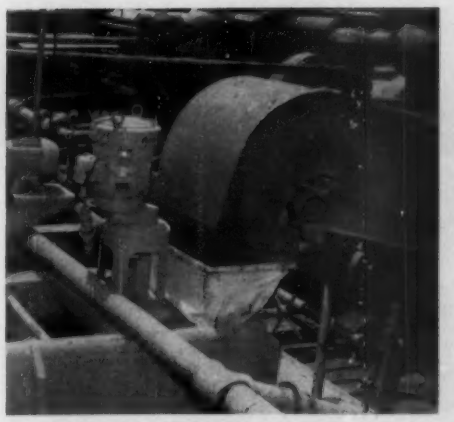
Barite and any other dense material which sinks below the surface may be mixed at high rates (up to 500 lb. per minute) with the high-speed mixers. Bentonite, gel material, and lost-circulation materials which tend to float are more difficult to handle. The floating tendency makes installation of the mixer very important. The object is to install the mixer so that there is a bottom-to-top turnover which will draw the floating materials down into the mud.

The flash mixer circulates mud through the mixing well in addition to dispersing additives. So, the mixing well should have a discharge hole directly under the mixer propeller. Mud reenters the mixing well through slots on the sidewall near the top. Provision should also be made for reentry of the mud into the well when the mud level in the suction tank is low. Where flowlines permit, routing mud returns through the mixing well gives better results. Fig. 29 shows general layout of a mixing well.

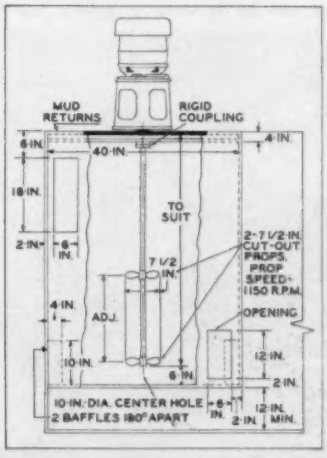
There should be good agitation in the suction tank so that freshly made up mud can be dispersed quickly. With a properly designed flash mixer and suction tank agitator, rapid changes in mud weight and viscosity can be made. The arrangement inside the mixing well is not critical with barite, but with gel and the like it can be most important. Vortexing is necessary to draw these lighter materials down below the mud surface. However, the lower part of the mixing well should have baffles to prevent vortexing and loss of pumping action out the bottom.

Other mixers . . . Many mud chemicals are quite expensive and unless they are well mixed, they are not as effective as they should be. Others are dangerous to handle without mechanical assistance. For these cases, a small (usually ⅓-hp.) chemical mixer is an advantage. Cost is small and much labor can be saved with these.

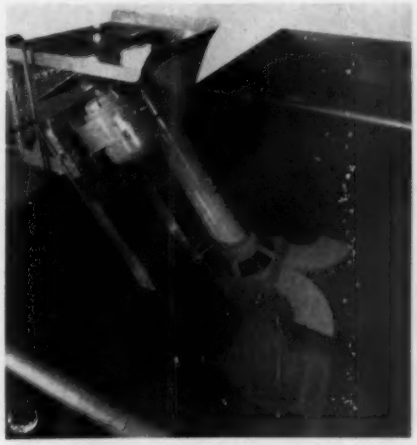
Also on the market are large—more than 20-hp.—units like those in Fig. 30 which serve as combination mud mixers and pit agitators. These handle gel material well and are frequently used on large dug pits.



MOTOR-DRIVEN FLASH MIXERS such as this are installed in a well in the suction pit. They take the place of special mud mixing pumps and hoppers. Fig. 28.



INSTALLATION OF FLASH MIXERS is important. For materials which tend to float, the mixer must form a vortex and have a pumping action out the bottom hole. Mud reenters the mixing well at the slots around the top. Fig. 29.



COMBINATION AGITATOR-MIXER UNITS such as this have been used on large steel tanks and on earthen pits. Some models have more than 20 hp. Fig. 30.

DECANTING CENTRIFUGE in place atop mud tanks. Not all mud flow need be processed through the machine because not all clay solids should be removed. Usually, the machine can do its work in only a few hours each day. Fig. 31.

CYCLONE SEPARATORS like this one recover barite from weighted muds, as does the decanting centrifuge. The machines prevent the necessity of watering back the mud. Fig. 32.

MUD DEGASSERS should be installed between No. 1 and No. 2 tanks and all return mud flow should be processed. The machine removes entrained gas by pulling a vacuum as the mud flows over baffles. Fig. 33.

Centrifugal concentrators, degasser

THERE ARE SEVERAL pieces of mud-treating equipment which are frequently used for deep-well drilling but which are not ordinarily a part of the rig's permanent system. Some such items are the centrifuges, cyclone separators, and degassers.

In most cases these items are merely rented for the job, but many rigs, particularly those operating outside the U. S., have them as permanent equipment.

Mud centrifuges and cyclone separators have the same purpose—to remove the low-density clay solids from the mud. These solids are ordinarily removed by watering back the mud. However, watering back also throws away the valuable barite in weighted muds. Centrifugal concentrators pay their cost by reclaiming the barite.

The centrifuge shown in Fig. 31 contains a bowl which rotates at high speed. Inside the bowl is a screw conveyor which rotates in the same direction of the bowl but at a slower speed. This conveyor moves the barite from the sides of the bowl and carries it to the discharge. Rejected fluid and clays flow out a hose to the reserve pit.

The machine must be cleared of all mud and mud solids before it can be shut down. Otherwise, the bowl might be stuck by settlings and damaged when the machine was next started. To wash out the bowl, the centrifuge has a water connection and the water flow is continued after mud is shut off; the machine continues to run with the water for some time afterwards until clear of mud.

Normally, the centrifuge can do its job on a mud system in only one to three circulations, or in 2 to 6 hours per day. This is because not all clay solids need be removed from the mud to get good mud properties. Likewise, the cyclone separator need be run only a few hours each day.

The cyclone separator shown in Fig. 32 operates much like the mud desander. The difference is that the underflow from the cyclone separator is salvaged where the overflow is salvaged in a desander.

Mud degassers . . . Homemade devices to remove gas entrained in drilling mud may serve well in light, low-viscosity muds, but their efficiency is low in heavy, viscous, and badly gas-cut muds. These fluids usually can be satisfactorily degassed only by a commercial machine like that in Fig. 33.

The commercial degasser pulls a vacuum on the mud, and has many internal baffles with large surface area where gas bubbles may break out.

Chief benefit of a degasser is that it enables the mud man to measure the exact weight of the mud. Without a degasser, weight can't be measured and too much or too little barite may be added to the mud. Result could be waste, loss of circulation, or a blowout.

Degassers normally require a conventional duplex pump for charging since the machines use a high-pressure jet. Some, however, have been modified to work with low-pressure centrifugal pumps.

The degasser is usually supported over the space between the No. 1 and No. 2 tanks. Then, rate of flow through the machine is normally set at slightly more than the well's circulating rate. In this way all return mud is degassed before arriving at the pump suction.

Mud instruments

DRILLING MUDS often contain abrasive materials, corrosive chemicals, and solids and liquids which may settle out. Moreover, the mud is handled under high and pulsating pressure. These facts make it extremely difficult to build reliable and economical instruments to keep track of the mud system.

Still, in drilling it is quite important to know such things as: pressure at the standpipe, volume of mud being pumped into the well, volume coming out, level in the pits, gas content of the mud, density and viscosity of the mud, and other mud properties. Many ingenious instruments have been built to measure these things but most have been too expensive or too difficult for rig crews to keep in operation.

The only mud instrument used on many drilling rigs is the standpipe-pressure gage like that in Fig. 34. For this service, the gage must be extremely rugged and heavily damped. Were it not for the built-in damper, the gage needle would swing with every stroke of the pump so it could not be read. And, were it not for construction features which keep mud from contacting working parts, the gage would not last long.

No maintenance is needed on the mud gage and it will last well if not abused. Under no conditions should the rig personnel attempt to repair a faulty gage; it should be returned to the manufacturer. The plexiglass lens on a gage should never be cleaned with steam nor painted over.

Pump instruments . . . There is no cheap and commonly used instrument for measuring pump output; rather, output is figured indirectly by counting the number of strokes the pump makes each minute. The strokes are a good indication of pump output because power-pump speed varies little and because pump efficiency is near 100% if there are no leaking parts.

Likewise, there is no instrument in the field to measure the exact amount of mud coming out of the hole.

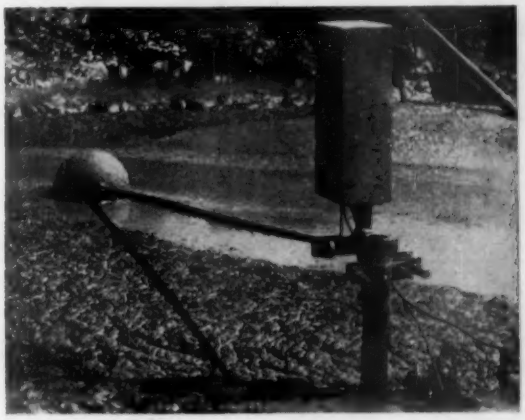
Fortunately, there's a natural means of comparing the amount of fluid pumped into the hole with the amount coming out. Although electronic devices have been used for this, the usual method is a pit-level indicator. If pit level remains constant, the amount coming out of the hole is equal to that going in. If pit level is rising or falling, it's a sign that there's trouble because the hole is either "taking" or "making" fluid.

Because the pit-level indicator is an important instrument in lost-circulation or high-pressure country, it should be installed properly. The recording device should be placed on the derrick floor where it may be easily seen by the driller. The float should be placed in a quiet location in a small suction pit where it can quickly reflect any variation in pit level.

A newer tool is a differential flowmeter which can show the difference in flow into and out of the well quite accurately. It is, of course, more expensive than the simple pit-level indicator.

Several instruments have been used to measure weight of the mud. Only device now commonly used depends on the difference in pressure head between two points in a vertical column of mud. This pressure differential is a direct indication of density and is recorded as pounds per gallon on a recording chart. Fig. 36 shows the recording element of a mud-weight instrument.

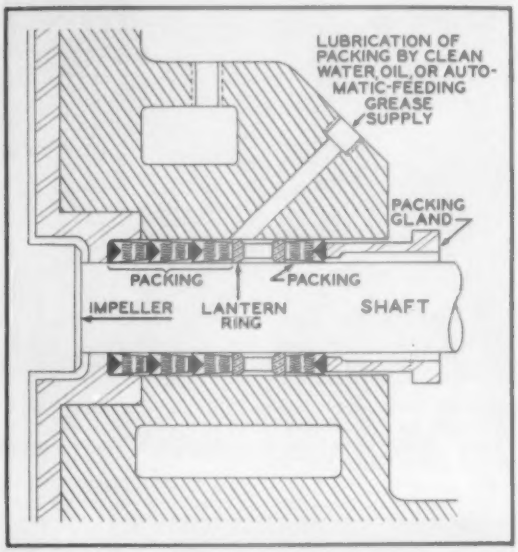
STANDPIPE-PRESSURE GAGE is universally used on drilling rigs but is the only instrumentation on the mud system on many rigs. The device is rugged and reliable but no attempt should be made to repair it in the field. Fig. 34.



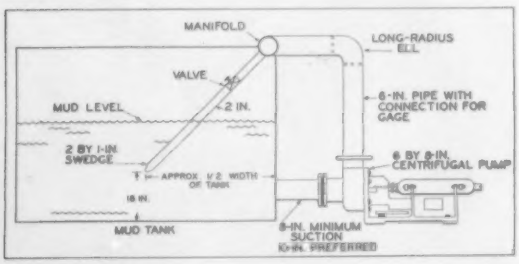
PIT-LEVEL INDICATOR, whose ball float is shown here, is simple means of determining if well is "making or taking" fluid. It should be installed in quiet portion of the suction pit. Fig. 35.

RECORDING PORTION of a device for determining mud weight. This instrument picks up samples periodically, weighs them, dumps, and picks up another after an interval. Fig. 36.

THE CENTRIFUGAL PUMP shown here is used for charging the suctions of the main mud pumps. Other centrifugals are used for mud mixing, water supply, and charging desanders, degassers, and the like. Fig. 37.



MOST IMPORTANT POINT of maintenance on a centrifugal pump is the stuffing box. It should have some form of pressure lubrication in order to keep mud out. Packing life is rarely less than 2 months and may be as long as 1 year. Fig. 38.



IF CENTRIFUGAL PUMP used for mud mixing is installed with these line sizes, suction will be adequate and discharge pressures will not be too high. Poor suction leads to damage by cavitation. Fig. 39.

Centrifugal pumps

CENTRIFUGAL pumps are quite often used on drilling rigs for mud mixing and agitating; they are also used as suction-booster pumps, mud-transfer pumps, and for charging desanders and cyclone separators. Fig. 37 shows one in use as a suction booster.

Although mud is a difficult fluid to pump with any device, centrifugal pumps normally have a satisfactory life in mud service. Packing life should rarely be less than 2 months even under poor conditions and is often as long as 6 months to 1 year. Parts other than the stuffing box may be expected to last up to 1 year.

Still, the stuffing box is the most important point for maintenance. If the packing isn't kept in good condition, the shaft will wear out quickly. It is best to have some form of stuffing-box lubrication. The lubricant—oil, grease, or water—should be forced into the box at a pressure high enough to keep mud out. The lubricant may come from a special lubricator or from the rig water-supply system.

Fig. 38 shows a centrifugal pump's shaft packing.

Suction conditions . . . If it's ever necessary to regulate the amount of fluid displaced from a centrifugal pump, this should never be done with a valve on the suction line. Rather, it should be done with a discharge valve. Whenever mud does not flow freely into the suction, the pump is "starved" and there may be "cavitation" inside the pump impeller.

Cavitation can often be detected by rapid changes in discharge pressure and it always causes damage to the impeller if allowed to continue. There may be bad vibrations and, in some cases, the metal of the impeller may be eroded away.

So, in installing a centrifugal pump for any service, there are several points to remember about the suction. Overlong and too-small-diameter suction lines should not be used. Also, the line should be free of sharp bends and an excess number of bends. Generally it is well to have the suction line one size larger than the pump-suction flange. There should be as few connections as possible in the suction line and these should be tight.

Fig. 39 shows a properly sized centrifugal-pump installation for mud mixing.

The problem of a good suction is worse with a heavy mud than with a light one and worse with a hot mud than with a cool one.

Operating the pump . . . For most rig services the centrifugal pump is driven by its own engine or motor. Size of the prime mover averages from 30 to 60 hp. Cost of a common centrifugal-pump size, the 6 by 5-in. or the 6 by 6-in. ranges around $600.

The centrifugal pump should be primed before starting since running dry can damage moving parts. If the pump is used as a suction booster, it may be primed by running the main slush pump which will draw fluid through the centrifugal.

Ordinarily, the pump should be started with the discharge valve closed. When the discharge is closed, the pump runs under the lightest load. After the pump comes up to speed, the discharge valve may be opened gradually to put it on full load. However, the pump should not be allowed to run shut-in for a long period. The fluid in the pump will heat up and can damage pump parts.

If, after starting, the pump throws out a little fluid

and then stops pumping, any one of three things might be wrong. It may be that not all air has been bled from the suction line and pump; or, perhaps, there is a leak in the suction or packing. Or, the suction line may be too long and too small.

Pump suction and discharge

THE LIFE of mud-pump parts depends in many ways on the surface mud system. For instance, a system which doesn't remove sand causes fast wear on fluid-end parts; and, a mud not properly degassed cuts pump efficiency. What isn't so well known is that a poor suction and discharge shortens pump life.

If the suction is inadequate, the pump will have a hydraulic knock above certain speeds. That knock spells early failure for both power-end and fluid-end parts. A poor discharge system places a needless back pressure on the pump and shortens its life.

There are two general rules for a good suction. First the suction line should be large in diameter, short, and free of excess bends. Second, the pump should be as near as possible the same level as the mud tank. It is not difficult on most rigs to have a flooded suction and to have the pumps set quite close to the suction pit. If these things are done, most suction problems are automatically solved. Moreover, a short, uncomplicated suction system is much easier to rig up and tear down.

Unfortunately, suction conditions are not as good as could be when: the pump must be set at some distance from the suction tank; or suction is from a dug pit; or mud is extra heavy, viscous, or hot; or pump speed is raised appreciably.

In these cases, there are two things that may be done: First, a good suction dampener may be used; or second, the suction may be charged with a centrifugal pump.

Best place for the dampener is at the pump-suction flange; this placement has the effect of putting the suction tank at the suction flange at the beginning of each stroke.

Unfortunately, a suction dampener isn't always effective. In these cases, the only recourse is to charge the suction.

Suction charging or boosting always improves suction conditions. In many cases, it improves volumetric efficiency of the pump. It reduces pump maintenance by preventing knocking. Fig. 41 shows one method of installing a charging pump.

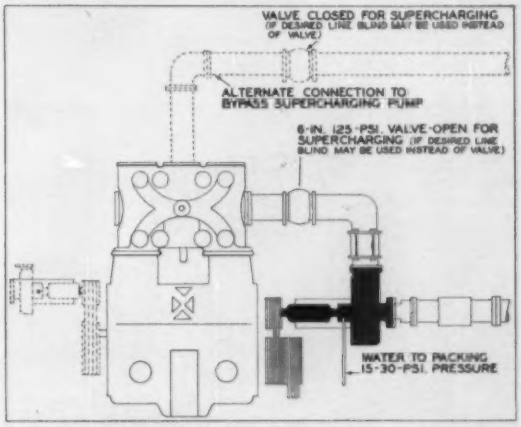
Unlike the suction dampener, the charging pump should be at the pit end of the line. This prevents suction problems on the charging pump itself.

Installed cost of a centrifugal charging pump is from $1,000 to $4,000 depending on whether the pump is driven off the main slush-pump shaft or by a separate prime mover.

Rules for the slush-pump discharge are about the same as for the suction. The discharge lines should be large in diameter, as short as possible, and fitted with generous large-radius cruves instead of sharp bends. If lines are not fabricated in this way, there will be excessive surging and vibration. Lines will fail early from fatigue, and cavitation at bends will cause damage. Life of the pump itself will be shortened and hydraulic horsepower delivered by the pump will decrease.

A pulsation dampener like that in Fig. 42 can prevent most of the ill effects of pump-pressure surges. Such a dampener should be installed according to the recommendations of the pump manufacturer.

LONG SUCTION LINES such as this should be avoided wherever possible. Problems of long suction can sometimes be overcome by a good suction dampener; or, if not, by charging with a centrifugal pump. Fig. 40.

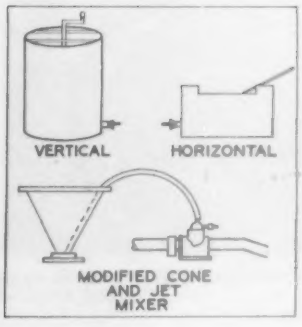

VALVE CLOSED FOR SUPERCHARGING (IF DESIRED LINE BLIND MAY BE USED INSTEAD OF VALVE)
ALTERNATE CONNECTION TO BYPASS SUPERCHARGING PUMP
6-IN. 125-PSI. VALVE OPEN FOR SUPERCHARGING (IF DESIRED LINE BLIND MAY BE USED INSTEAD OF VALVE)
WATER TO PACKING 15-30-PSI. PRESSURE

WITH THIS ARRANGEMENT, a centrifugal charging pump is driven off the sheave on the mud pump. Thus, no extra engine is needed. Suction charging generally increases pump efficiency. Fig. 41.

DISCHARGE-PRESSURE DAMPENERS prevent the damage done by pulsating mud. This is one of several types of dampeners available. Fig. 42.

A SUBSTANTIAL MUD HOUSE saves money by preventing loss of expensive mud materials. The mud house should be kept weathertight and materials inside should be neatly stacked. Fig. 43.

BULK BARITE HOPPERS on location make it unnecessary to break bags and handle barite by hand. With them, mud weight can be built faster but there is sometimes a problem in knowing exactly how much barite has been used. Fig. 44.



THESE ARE two frequently used styles of the chemical barrel and a modified hopper. Hoppers should be used with care to avoid plugging and boiling over. Barrels should be no more than waist high when installed. Fig. 45.

Storing and handling

MUD MATERIALS can be wasted on the rig in two ways. First, the sacks or containers can be torn or broken and the material spilled. Second, it can become wet and impossible to handle.

Many mud materials are quite expensive, some costing almost $1 per pound. For this reason, there's often a lot of money to be saved by preventing waste. One of the best ways to prevent waste is use of a substantial skid-mounted mud house like that in Fig. 43. And, indeed, most better-equipped rigs have storage houses for mud materials.

Size of the mud house depends on the amount of mud that needs to be kept on location. A small house may do on a well where daily treatment is light. A large house would be needed where treatment is heavy, where the supplier's warehouse is far away, and where there's a good possibility that new mud will have to be built up quickly.

Good housekeeping in the mud house will keep waste to a minimum.

Bulk barite equipment . . . In many areas where heavily weighted muds are used, the barite is delivered to location in bulk trucks and stored there in bulk bins like those in Fig. 44. Obviously, there is a great labor saving in adding the barite from the bulk bins directly into the mud-mix hopper. This relieves the crew of the tiresome job of breaking sacks. Moreover, many companies believe that there is less waste handling barite in bulk.

Sometimes there is trouble with moisture condensing in bulk bins; however, many operators report that barite in bulk is better protected from outside moisture. They also say that bulk barite can be mixed more evenly throughout the system and that it can be mixed faster in an emergency than sacked barite. And, since it saves space and handling, bulk barite is popular for offshore rigs and barge rigs.

Use of bulk barite has its problems too. One of the biggest is the difficulty in calculating exactly how much is being added to the mud. Most often, the amount of barite is calculated by the opening of the bottom nozzle through which the material flows. This isn't an accurate method and some operators have tried mounting the bins on scales to weigh the material out. Others rely on dip sticks which are lowered in from the top by hand to find barite level before and after use.

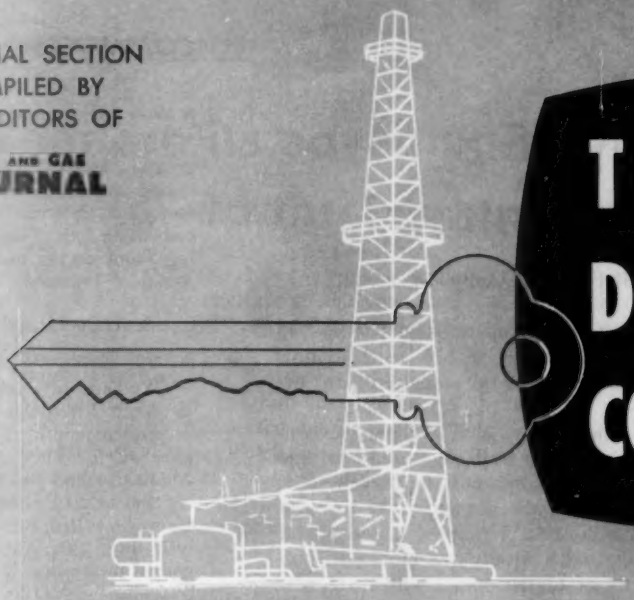
In spite of the problems, the number of wells using bulk barite will probably increase; bulk has proved cheaper and more satisfactory on many wells where heavy muds were used for long periods.

Chemical barrel . . . Generally, dry mud-treating chemicals can be added to the system through the mixing hopper. However, this is a procedure that must be done with care to prevent injury. If the hopper plugs, the mud may boil over and splatter those about with caustic.

Many drilling crews prefer to use a "chemical barrel," usually a 55-gal. drum mounted over the mud ditch. Water connection on the barrel should be near the bottom to keep down splashing. Also, the work platform at the barrel should be at such a height that the barrel is at no more than waist high to the man working on it; thus, face and upper body are safer from splashes.

Fig. 45 shows two styles of chemical barrels currently used and a modified cone and jet mixer.

A SPECIAL SECTION
COMPILED BY
THE EDITORS OF
OIL AND GAS JOURNAL



TURNKEY DRILLING CONTRACTS

What they are and what they mean to contractor and operator . . .

"Whether we like it or not, it is the coming practice. It is economic and it is sound," says one prominent drilling contractor.

"I don't want to see any more of it than there is at present. It's just another way for the drilling contractor to go broke," says another.

The "it" these men speak about is the turnkey drilling contract, easily the most controversial topic in the drilling industry today.

There seems to be no middle ground where the turnkey job is concerned; contractors appear to be either enthusiastically in favor of it or dead set against it. Some see in turnkey operation the salvation for a troubled contracting business; others view it as the quickest way to financial ruin.

To many small operators, buying a turnkey package is vital for their very existence. On the other hand, some major oil companies would no more let a turnkey contract than they would farm out their management. In between, you find producers of all sizes which habitually let turnkey contracts and just as many which do not.

In talking with advocates and opponents of turnkey drilling among both contractors and operators, Journal editors found sound reason for both points of view. But in these talks we noticed that certain key questions continually recurred. So we attempted to get the best informed opinions in the industry on these questions. From the opinions we got, this section was written.

We can report no final and positive solutions to the problems of turnkey drilling. But whether or not your company has taken or given turnkey contracts and whether or not you favor them, we believe that you'll find something of value here.

It is interesting that we found no one who seriously doubted that a contractor could turnkey most of his wells satisfactorily if he were so disposed. From the contractor's viewpoint, it boiled down to the question of whether, in the long run, he could profit from this more risky approach. From the operator's side, it summed up as to whether on the average he could get his wells more cheaply than under a standard contract and whether he would be wise to give up control of the multitude of small decisions on each well.

The contractor, all agree, first climbed way out on the limb when he began taking footage contracts. And he wouldn't be much farther out by assuming the relatively smaller measure of remaining risks in drilling and completing wells.

There has been a definite increase lately in the number of wells drilled turnkey. The increase, though no definite figures can be collected, is big enough that neither contractor nor operator can afford to ignore it. If this surge of turnkey jobs proves that the contractor does indeed make more money and the operator does save money, then turnkey contracts will certainly become the standard way of doing business in many areas.

1. What, precisely, IS a turnkey drilling contract?

NO TWO PEOPLE SEEM TO AGREE on exactly what "turnkey" means.

Roughly, a turnkey contract calls for the oil operator to pay only a certain sum of money to the contractor. Regardless of how well, or how badly, the job goes, the price paid usually remains the same. In turn, the contractor delivers a well "package."

The package may be big. That is, the contract may call on the contractor to build roads, prepare location, drill the well, log it, case it, and complete it into the tanks. In some cases the contractor may even settle damage claims from the landowners. These packages are truly turnkey.

Or, the package may be smaller; the contractor may be called on for little more than adding onto his footage bid a little extra money to perform some jobs (such as running casing or taking cores) which are normally done at day-work rates. These packages are often called "semi-turnkey."

The package may be any size in between. There's no drawing a line just where full turnkey stops and semi turnkey begins.

The turnkey contract differs from an ordinary footage contract in that the latter pays a lump sum (footage price multiplied by depth) only for actual drilling. Any additional work is paid for by the operator at day-work rates.

The turnkey contract is unlike the day-work which pays the contractor the same daily wage regardless of what the rig is doing.

Actually, today's footage and day-work contracts have many features which were once considered turnkey. For instance, 30 years ago, it was common for the oil company to provide the derrick, fuel, and water. These items are now almost universally provided by the contractor.

2. What's NEW about the recent turnkey contracts?

THE LARGE SIZE OF THE OPERATORS letting recent turnkey contracts has been the surprise. Some of the nation's biggest producers have taken turnkey deals during the past several months in areas where normally they would ask for footage bids.

Traditionally, these large, well-staffed companies consider the turnkey contract only in certain joint-ownership wells and in areas outside their usual realm of operation. However, these companies have all recently put emphasis on cost cutting. This emphasis has forced them into exploring every possible avenue toward cheaper wells. Several report uncovering situations where turnkey contracts meant major savings.

Of course, lump-sum payment for drilling and completing is almost as old as the oil business itself. In several shallow areas, drilling contractors have for many years sold well packages including drilling, completion, installing a pump and tank battery, and putting the well on production. Some firms even contract the well pumping after completion. Heretofore, with few exceptions, only small independent operators have taken advantage of these deals.

Most drilling contractors today have their own production. Many got part of that production by turnkeying wells, receiving a part interest in the well in payment for their work.

COMMENTS

A West Texas contractor—

"Turnkey contracts in our area uniformly call for our providing the location, road, surface and intermediate casing, cementing, the basic electric logs, and coring and drill-stem testing if required.

A large Southwest contractor—

"We handled a couple of jobs in South Louisiana that might be termed semiturnkey. In these jobs we furnished and set the conductor pipe and surface casing and also furnished the mud. Contract called for drilling the well to a certain depth at an agreed total price. The operator took over at that depth, ran logs and the production string. We were paid day work for everything after reaching contract depth."

A large Mid-Continent independent—

"In our only experience we provided nothing but the leases."

•

Major-company executive—

"We believe there's a lot for us to gain in turnkeying wells. We used to provide everything, even prepare the locations. Now, we think that we're better off simply to set a stake and let the contractor provide the rest."

Veteran consultant-independent—

"My partner and I turnkeyed a well in East Texas in the early '30's and we didn't even have a rig. We just agreed for a certain sum of money to get the hole drilled, completed, and turned into the tanks."

Contractor newcomer—

"We have begun taking turnkey contracts, some for large companies. This way, we have access to work we wouldn't get otherwise."

3. What are its advantages —to the contractor?

FREEDOM IN PLANNING and carrying out the drilling program is the basic advantage of a turnkey contract to the contractor. A turnkey job allows him to substitute his skill for the direction of the operator. Thus, the contractor:

1. Has complete control over the conduct of the job.
2. Can pick the best mud program for drilling speed, safety.
3. Is not interrupted by unexpected changes of orders.
4. Has a larger cash flow on which to profit.
5. Better uses the talents of his own employes.

The result of these things, many times, is:

1. Better scheduling of operations.
2. Speedier decisions.
3. Faster drilling.
4. Opportunity for more profit.

There's an old song frequently sung by contractors which goes, "Closer cooperation between operator and contractor would save money for both." Doubtless, the claim is true. That is why a turnkey contract is so tempting to contractors: it eliminates the need for operator cooperation. The contractor is free to do things whatever way is best and safest.

Since most contractors drill wells for their own account, they have men who are capable of directing the mud program, casing program, and completion. On footage contracts, this contractor knowledge is wasted. But, on a turnkey well, the contractor has the opportunity to use to the fullest extent the personnel he already has.

Should the contractor expect to add a profit for himself onto the bill for third-party services? Both operators and contractors agree that he should. Third-party work such as preparing the location, cementing, logging, and mud maintenance must be supervised. If the operator supervises, it adds to his overhead. Thus, it is worth something to the operator to have the contractor supervise third parties.

This percentage charge for supervising subcontractors is, of course, common practice in construction contracts.

4. . . . and to the operator?

THE TURNKEY CONTRACT relieves the operator, or oil company, of three highly expendables—

1. Most of the drilling risk.
2. Much overhead expense.
3. Most supervisory expense.

Thus many operators believe that their turnkeyed wells are, on the average, cheaper. It is against the pressure for cheaper wells where the turnkey contract must stand or fall.

Searching for oil and gas-bearing formations is uncertain enough without the risk that goes with the mechanics of making a hole in the earth down to that formation. For that reason many operators are happy to pass drilling risks on to someone else.

In granting a turnkey contract, the operator budgets an exact amount of money for his well; there are no open-end expenses, no uncertainties about ultimate cost. Of couse, in eliminating some of the gamble, the operator must be prepared to pay slightly more in direct cost on any particular well than he would for a footage contract.

Much of the turnkey work done in the past has been for companies too small to have someone on the staff who could properly oversee a con-

COMMENTS

V.p. of large contracting firm—

"On a normal contract, the operator may at any moment want to change mud or run logs or some such. This type of interruption isn't expected when we negotiate a turnkey contract.

"The contractor is able to make a bit more money in a lot of cases by tacking on a fee for the extra services in addition to the actual cost to the contractor of providing these services. It is worth it to the operator to pay more because he saves in bookkeeping, personnel, and other overhead."

Rocky Mountain operator—

"The contractor's greater control of the drilling program should result in faster hole and safer conditions."

A major producer—

"The contractor knows how much total money he is going to receive when he bids on the job. He can calculate his margin of profit on the entire amount rather than on the footage rate only. If he has a good run, his profit is greater."

Major producer executive—

"My company knows how much money we will pay for the completed hole and can budget our expenditures accordingly. Also, we don't need as much supervision to get the oil into the tanks."

Producer—

"My company likes the idea of having less responsibility, less hazard, and a fixed total cost."

ventionally contracted well. For such operators there is no alternative to the turnkey contract.

But, in certain areas, some of the nation's biggest producers who do have large and capable staffs find they have saved money by letting turnkey contracts. The difference is in overhead and supervisory expense. Generally, the larger the company, the higher these expenses are.

Some operators recognize that, since they no longer have their own drilling departments, they have few people with the experience necessary to supervise day-to-day rig operations. These companies see the turnkey contract as a logical way to compensate for this personnel shortage.

Some major companies who feel ready to stand their own risks still let turnkey contracts on certain types of partnership wells. Often, the major finds itself with a partner who is too small to accept his portion of well expense in case there is trouble. Then, for the sake of this small partner, the major lets a turnkey contract so that ultimate cost is fixed before drilling begins.

5. What are its disadvantages —to the contractor?

CONTRACTORS see two main disadvantages to turnkey work:

1. There is more risk.
2. More of the contractor's working capital is tied up.

Obviously, there is more risk anytime a contractor undertakes more work for a fixed sum. As most urnkey contracts are written, if the contractor loses the hole he also loses the money he has invested in it. Few contracting firms could stand big losses on several successive holes.

Contractors who regularly take turnkey contracts point out that this is essentially true also of footage contracts. Just as with footage contracts, these firms believe that they must make enough profit on the trouble-free wells to provide a cushion when disaster strikes.

Other contractors say that the operators are reluctant to pay for the contractor's added risk. In cases where this is true, the contractor would be ill advised to gamble on the well having no trouble.

All drilling contractors occasionally have trouble today because payment for their work is delayed. Delayed payment means tied up working capital in any business. Turnkey contracts don't ease this situation.

Some drilling contractors believe that it may be possible eventually to use the same sort of progress payment in turnkey jobs that is now made on many long day-work contracts. Thus, a turnkey contractor might receive a certain portion of his money at an intermediate casing point and the remainder at total depth.

6. . . . and to the operator?

GIVING UP CONTROL of such things as mud, samples, cementing, logging, etc., is the most frequently voiced objection of operators. Certainly, the operator can specify in the contract the type of materials to be used in the well. But, it would be impossible to specify all the details on how these materials will be used.

Moreover, many operators do not care to be restrained from stopping drilling to log, take cores, and the like.

Some operators fail to see that they get their average well cheaper by having it turnkeyed. They say that the increase in direct cost is not offset by the reduced risk, lower overhead, or decrease in supervision. Still others say that in granting turnkey contracts, they lose the volume discount that they get for well materials.

Some individuals in the producing companies believe that drilling

COMMENTS

A large drilling contractor—

"A prime advantage to the operator is that the turnkey contract minimizes his supervision. He doesn't need to keep a drilling engineer on location. He is completely free of the drilling worry until the contract depth is reached. He doesn't have to carry purchases of conductor pipe and surface casing on his books. He doesn't have to design and supervise a mud program nor buy the mud and keep it on his books."

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Drilling engineer—

"Ordinarily, the contractor has only his moving, fuel, bit, labor, supplies, repair, and overhead expenses out of pocket. This might amount to, say, $60,000. If he then assumes making the location, building roads, buying casing, paying for third-party services, and the like, he might be out $200,000, an amount few contractors can afford to have out."

V.p. of international drilling company—

"The contractor in taking a turnkey job is taking on more risk without getting paid for it. The operator is able to demand and get this kind of service because of the depressed condition of the contracting industry. The operator isn't paying for it now. And, when conditions get better, he probably won't ask for it."

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Independent operator—

"The operator is taking greater risk. The contractor takes all risks on trouble; all lost circulation, fishing jobs, and the like are on him."

Mid-Continent independent—

"The contractor has to cushion his bid for unexpected troubles. He has to do this on every well where trouble might occur on only 1 in 10 wells. Consequently, the operator pays for nine contingencies that do not occur."

A major producer says he usually finds "higher initial cost" in a turnkey well.

progress would be slowed by heavy emphasis on turnkey contracting. Most experimentation in drilling methods is done by major oil companies; few individual contractors can afford experimentation. So. there is some fear that the interest in, and the opportunity for, experimentation would be lost should turnkey work become the standard.

Other producers say that there are areas in their companies where a turnkey well is economic only because of special circumstances. The company, they say, can take its own risks but in some areas it would mean hiring extra personnel to supervise a footage-drilled will. In other areas, they say, they must have the personnel whether needed to supervise the wells or not.

7. More profit to contractor?

THERE MUST BE MORE PROFIT in turnkey drilling if the industry is to use it on a wide scale. Else, the contractors cannot afford to switch from today's conventional contracts.
a turnkey contract depends, apparently, on several things:

Today some contractors routinely take turnkey contracts and happily say that they do so because it means more money. Others say that they have turnkeyed wells but don't care to make a habit of it because there's too little profit.

Whether or not any particular contractor can expect added profit from

1. The contractor's skill in drilling.
2. His ability as a business manager.
3. The market for rigs in his area at the moment.
4. The willingness of the operator to pay a just price for a turnkey well.

Obviously, if a contractor is third rate in drilling and business ability, the turnkey contract is full of pitfalls for him. But, even if he is a first-rate well man and business man, he still has two big obstacles to hurdle. First of all, the chance for profit must be weighed against the market for rigs. Take the all-too-common situation where there is an excess of rigs available and where competition for work is keen. Contractors in this situation are apt to bid with little hope for profit. As a result, the turnkey contract is no more likely to be profitable than any other type of work.

Then, take a healthier situation where rig demand is balanced against rig supply. In such a case, contractors have every right to expect a just profit on any of their work. Then, the opportunity for added profit from a turnkey job is good.

Of course the problem remains to sell this mode of operation to the operator. Whether or not the operator can be sold depends on his own particular situation. Is he willing and able to assume all his own risks? Is his overhead high? Would he be able to supervise drilling capably and cheaply?

8. Cheaper well to operator?

IT IS QUITE OFTEN CHEAPER, but not necessarily so, for the operator to let a turnkey contract. The turnkey well is cheaper if the operator would otherwise pay out higher overhead and supervisory costs. It won't be cheaper on the average if only direct drilling costs are considered.

The methods of charging administrative and overhead costs to the drilling operation varies from company to company. The availability and cost of supervisory personnel vary from area to area within the same company. Thus it isn't hard to imagine a well which would be cheaper if drilled turnkey in one spot but which would not be cheaper if drilled by the same company 5 miles away. Or, by the same token, one particular

COMMENTS

An official of a large combination drilling-producing firm says the operator letting a turnkey contract would have, "less control in obtaining desired formation samples and less opportunity to advance drilling practices.

Drilling contractor—

"I can see no disadvantages to the operator unless it might be that he is giving up control usually of such things as mud program and his right to interrupt drilling whenever he wants for running logs and such."

●

Drilling contractor—

"We have turnkeyed a half-dozen wells in the past 2 years in Louisiana, Mississippi, and Alabama. We have done real well in four of these but not so hot in the others. The reason was fishing jobs which would have hurt just as bad in footage-drilled holes."

Talking about another operation, the same man said, "A contractor would be a fool to agree to do all this and take on the added risk without charging extra. In one case, we made $10,000 to $15,000 more on a turnkey well than we did on a footage contract in the same area although we actually did essentially the same work at the same outlay."

Another contractor says that there is more profit if "bid is properly calculated and full attention is given to the additional risk hazard. It means more cash flow. However, the ultimate risk loss may cancel this."

A third contractor believes "turnkey contracts usually mean a bit more profit but not enough to make the contractor go out and seek them."

●

Representative of large integrated company—

"The turnkey contract frequently means a cheaper well, but not always. If the operator properly charges to the well all of his administrative and overhead costs then it is usually cheaper to turnkey. Some major operators are disappointed be-

well might be cheaper to one company if turnkeyed but would be more expensive to another.

There are many instances where the overhead and supervisory costs would be approximately the same whether one particular well is drilled or not. In such a case, a turnkey well may hold little attraction.

It was, of course, quite common in times past for big oil producers to own their own rigs and to drill their own wells. Now, few producers own rigs. More than 90% of all drilling is done by contractors. An inescapable result of this trend is the fact that the backlog of experienced drilling men inside the producing companies is continually diminishing. Thus, oil producers, majors and independents alike, are steadily growing less qualified to direct day-to-day drilling operations.

It is no secret that even today some of the men sent by producers to oversee the contract rig are grossly unqualified both in experience and judgment. Bumbling by such men, although concealed from their employers, can cost tens of thousands of dollars on any well.

A turnkey drilling contract puts the responsibility squarely on the people most qualified to have it: the drilling contractors. It removes the authority from those who daily grow least qualified to have it: the operators.

9. Can major operators profit?

PERHAPS NOT AS OFTEN as do independents, but just as surely, major producers can save money by letting turnkey contracts.

Chief factor that favors turnkey contracting is the red tape and slow movement that hinders many large companies. Another factor is the truism that overhead expense goes up in direct proportion to the size of the company.

Major companies do have, of course, the best of geological and engineering help. For that reason they can seldom profit from getting such well services elsewhere.

10. In case of trouble is there protection for contractor?

A RISK FACTOR IN HIS BID is the only protection for the contractor in most turnkey arrangements. If he includes this factor on enough routinely drilled wells, then the contractor will have a cushion for the wells on which he has a loss. For, if the contractor miscalculates his costs or has misfortunes on any portion of his turnkey package, he must bail himself out as best he can.

In turnkeying, the contractor assumes the risks of operations done at day-work rates on footage contracts. These operations include running casing, cementing, logging, coring, testing, and the like. How much does the contractor expand his risk when he does these things turnkey? It depends on the area. Perhaps in one area, 95% of all risks are on the footage portion of the hole; perhaps in another, less than half is the responsibility of the footage contractor.

Some semiturnkey contracts are written with provisions that are roughly the same as the "Gulf Coast" and "chert" clauses so often used in the past in footage contracts. These protective clauses free the contractor from liability in event of certain "natural calamities" such as lost circulation, crooked hole, heaving shale, etc. Such protective clauses reduce the contractor's risk but also reduce his chance for profit.

Also, turnkey contracts in some areas have been written with a monetary limit on the amount of mud or cement that the contractor is required to buy.

COMMENTS

cause of the higher turnkey price compared to footage prices. But, when they consider the operator's hidden costs, it generally equalizes."

Engineer for a contracting firm which turnkeys regularly—

"We can often save the operator money on materials. For instance, when we drill on footage or day work, the tool pusher is more likely to add new mud materials to the system if there's some question. It doesn't cost his company anything; it costs the operator. But when we turnkey it's a different matter. The mud material is charged as expense to his rig; he thinks twice about it and looks for ways to do things cheaper."

●

Production supervisor for major company—

"A major company can't realize a saving from a turnkey contract as often as does an independent but it is still possible because of the inefficiency and duplication of effort that exists in most major companies."

Production department manager for producer-contractor—

"Turnkey jobs appear to be most attractive to the individual or group of individuals who must rely upon either a turnkey operation or placing the well under control of a consultant."

Major-company engineer—

"We saved between 30 and 40% by letting a turnkey contract for a slim hole instead of letting a footage contract for a conventional hole. It's hard to sift out just how much benefit came from the turnkey contract and how much from the slim hole. But, we know the turnkey part was important."

●

Gulf Coast contractor—

"In case of trouble, we certainly would be stuck, particularly if we were working for the independents."

Major oil company spokesman—

"Protective clauses can and should be inserted in turnkey-type contracts to cover abnormal risks. The amount of protection should vary with the risks involved."

11. More personnel needed?

MANY CONTRACTORS would need extra personnel were they to switch to full turnkey contracts for a majority of their work. Others could do quite well with the staffs they already have. This is particularly true of those which already have production of their own.

To drill turnkey, obviously, demands a wider range of personnel services than to drill on footage or day-work rates. In talking with contractors, Journal editors found that the ability to provide these extra services from within the contracting company is purely an individual situation. Some can provide the services now; others cannot.

12. Who provides what?

CONTRACTORS WOULD FURNISH EVERYTHING in a full and complete turnkey deal. However, this is seldom the case in actual practice today. Only for the smallest of independents and usually only in the shallowest of areas, does the contractor furnish surface production equipment. Larger operators usually prefer to select such equipment for themselves.

While there are thousands of variations in the turnkey contracts used, they fall into patterns according to the area and according to the likelihood of the well's being completed as a producer. First of all, the operator ordinarily provides the lease, location stake, and the money. However, he may furnish nothing but the lease if the contractor is drilling the well to earn an interest in the lease.

The contractor, of course, furnishes his rig, crews, bits, reamers, expendable supplies, and any other equipment needed at the well. He also provides a road and prepare the location on dry-land jobs. The operator may pay for these last two items on swampy or water locations.

Usually, the contractor furnishes the conductor, surface, and intermediate pipe as well as the cement and cementing services for them. If the well is certain to be a producer, the contractor may also buy, run, and cement the oil string.

Mud materials and supervision are the expenses of the contractor down to contract depth. Only in deeper drilling or in areas where mud is heavily treated does the operator agree to pay mud bills beyond a certain maximum sum. If there is any day work done at the request of the operator, he is expected to pay for mud materials added to the system during that time.

Most turnkey contracts call for the contractor to pay for one or more basic well logs when contract depth is reached. Many also require the contractor to core the pay formation.

It is common for the operator to take charge at contract depth. If the well is to be drilled deeper, cased and completed, or tested, these things are done at day-work rates just as in footage contracts. If, during drilling, the operator chooses to interrupt for coring, logging, testing, or the like, this, too, will be paid at day work.

If the well is a wildcat, the turnkey contract frequently calls on the contractor to plug the well and clean and level the location should no production be found.

Tubing, packers, wellhead, flowlines, and tanks are most often provided by the operator on producing wells.

13. What's a typical contract?

THERE'S NO STANDARD written form for turnkey contract any more than there has been a standard footage contract. Actually, there's little difference between the general arrangement of the two for most wells;

COMMENTS

Another turnkey contractor—

"Our semiturnkey jobs contain conventional clauses to protect against trouble from heaving shale, lost circulation, and abnormal pressures. There really is no more risk from this standpoint than in normal footage contracts."

A Mid-Continent contractor—

"The contractor faces the possibility of fishing jobs while performing day work which is otherwise the operator's responsibility."

●

Houston-based contractor—

"We wouldn't have to hire extra people to do a turnkey job. We already have a geologist which some firms don't. And our tool pushers are capable of handling mud and most other engineering."

Oklahoma City contractor—

"It will require a larger organization to handle such operations, no small part of which will be the additional accounting necessary to handle the purchasing and invoice processing associated with the activities over and above the usual drilling operations."

●

Major integrated company—

. . . says that in a turnkey form it commonly uses, it provides "typically the following: base consideration of dollars, oil-string casing if it is run, and protection clauses for a maximum of 24 hours on loss of circulation, day work if abnormal pressure is encountered, and paying for all mud added to the system while on day-work basis. The contractor furnishes: road and location, surface casing, cement and cementing surface for surface casing; all mud and mud admixes; drilling to total depth, logs, running casing and WOC time if oil string is run, or plugging well, cleaning and leveling location if a dry hole."

Large drilling company—

. . . says it expects to provide "generally all expenses relating to well location, drilling, casing except the oil string, third-party services, one 50-ft. core, one

the turnkey form simply has a longer list of items set out as being the responsibility of the contractor.

Many turnkey jobs are done on simple letters of agreement just as are many footage wells

It may be that a greater percentage of turnkey contracts are presently let at negotiated prices than are footage contracts. However, open and competitive bidding is still the usual manner of awarding turnkey contracts.

14. Where do they work best?

ALMOST ANYWHERE footage contracts are used, wells are also being successfully turnkeyed. The principal exception are areas where muds are heavily treated and expensive. Average mud bills mean little in many deep-drilling areas and few contractors are anxious to assume this expense and gamble profit on having a cheap mud bill.

However, turnkey contracts are not uncommon in shallow and medium-depth wells along the Gulf Coast where muds are customarily more expensive than in most other areas.

Contractors have always been cautious about taking footage contracts in areas with which they are totally unfamiliar. As you'd expect, they usually seek turnkey work only in areas where they have drilled extensively.

Wells have been satisfactorily turnkeyed in every major drilling province in this country. Moreover, several big-money drilling deals in foreign countries have been drilled on contracts that contained many turnkey features.

15. What about their future?

MANY PREDICT A SWITCH to turnkey drilling in a greater and greater portion of domestic wells. These people point to the slow but steady adoption into footage contracts of many items that were formerly considered turnkey. There is, they say, no reason to expect that this trend will be reversed or halted.

In fact, these people contend that the drive for economy by oil companies will accelerate the trend. The economy moves have taken various forms, but many included not only drilling fewer wells but also reducing personnel and cutting overhead expense.

Many other industry people see no significant change in the number of wells that will be turnkeyed. There has been, they say, no basic change in the economics or technology of drilling, that make a turnkey well any more attractive than it has been in the past.

Most contractors say that they are prepared to take turnkey contracts in areas with which they are familiar if the price is attractive enough. Most producers say that they would consider a turnkey deal if the contractor is able to show them where they can save.

Turnkey advocates say that the future is likely to bring some important changes to this form of contract. It is likely, they say, that the turnkey drilling contract will take on more features of the turnkey construction contract. For instance, on long jobs, the contractor might receive a monthly payment instead of a lump-sum payment at the end of the well. In such cases, the contractor might be required to post a performance bond.

Regardless of who is right about turnkey contracts, industry observers point out that drilling is undergoing profound change. This much is obvious when today only two rigs can drill the same number of wells annually that it took three rigs to drill only 6 to 8 years ago.

COMMENTS

electric log." This contractor says the operator will provide "location stake, coring and lodging time in excess of the contract agreement, oil string, completion wellhead, tubing, and rig time for the completion itself."

Gulf Coast contractor—

"On some of our jobs for independents, we just have a letter of agreement. The two major companies we've worked for used their standard contracts and just enumerated the extra services we were to give."

West Texas contractor—

"We use a more-or-less standard contract. The obligation is exactly the same as in a footage contract."

Frequent spokesman for contracting industry—

"In the not-too-distant future, I believe a great many of the contracts will be on a 100% turnkey basis. There is really no reason why this should not happen if the companies are interested in reducing drilling costs."

●

International contracting-company executive—

"There appears to be a trend in foreign operations toward various degrees of turnkey operations, and it seems at the moment that the greatest advance in turnkey work will be for operations in foreign countries, and particularly at wildcat locations."

Domestic contractor—

"In our opinion, destructive competition forces the contractor to accept this route in order to get work. He will inevitably suffer from taking risk not rightfully his."

Another contractor—

"We will never take on a full turnkey job. There are enough risks in this game without taking on still more that you can't calculate."

Major company—

"We expect the number of turnkey contracts to increase in the future."

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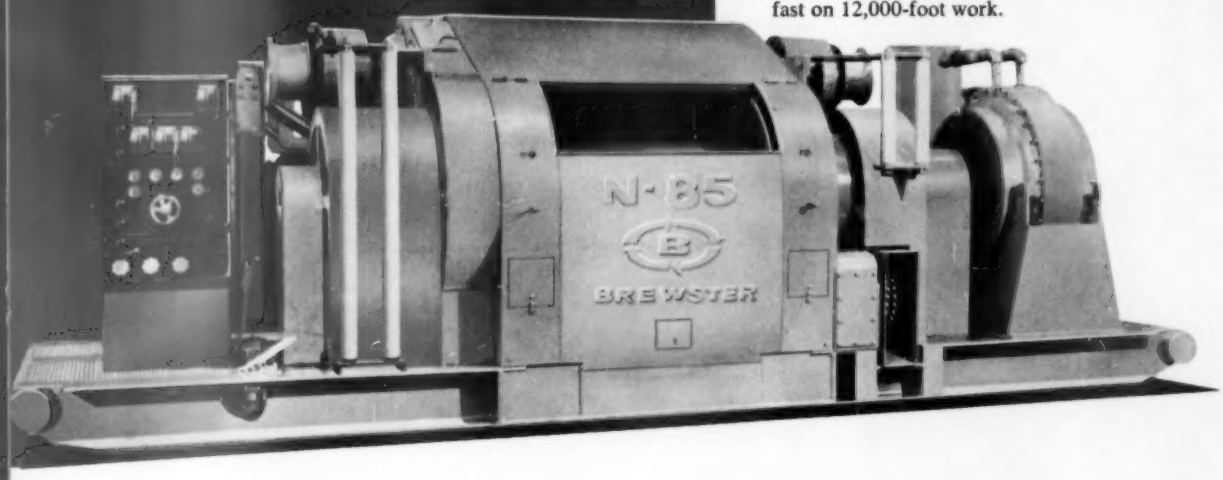

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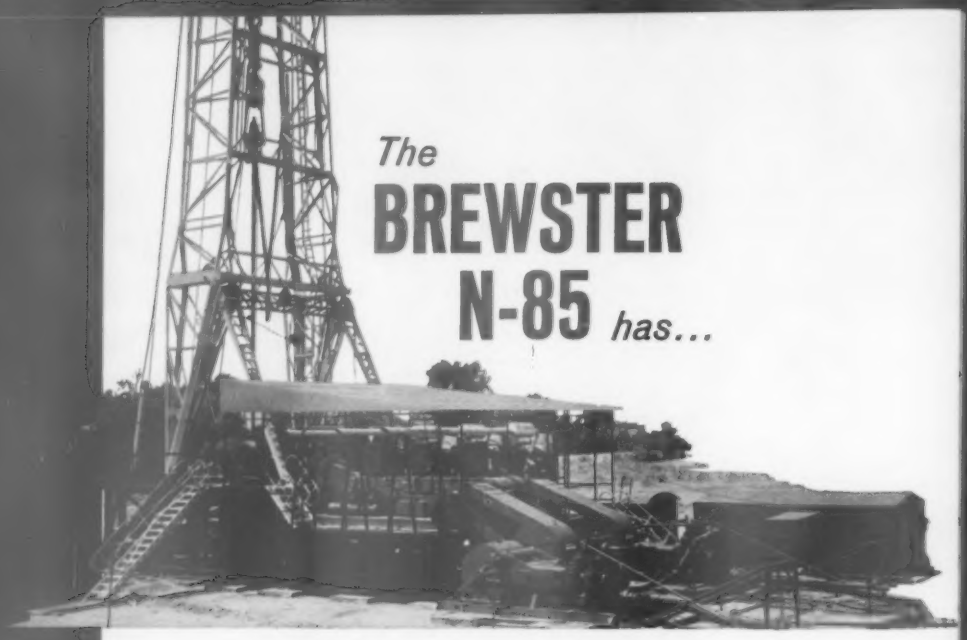

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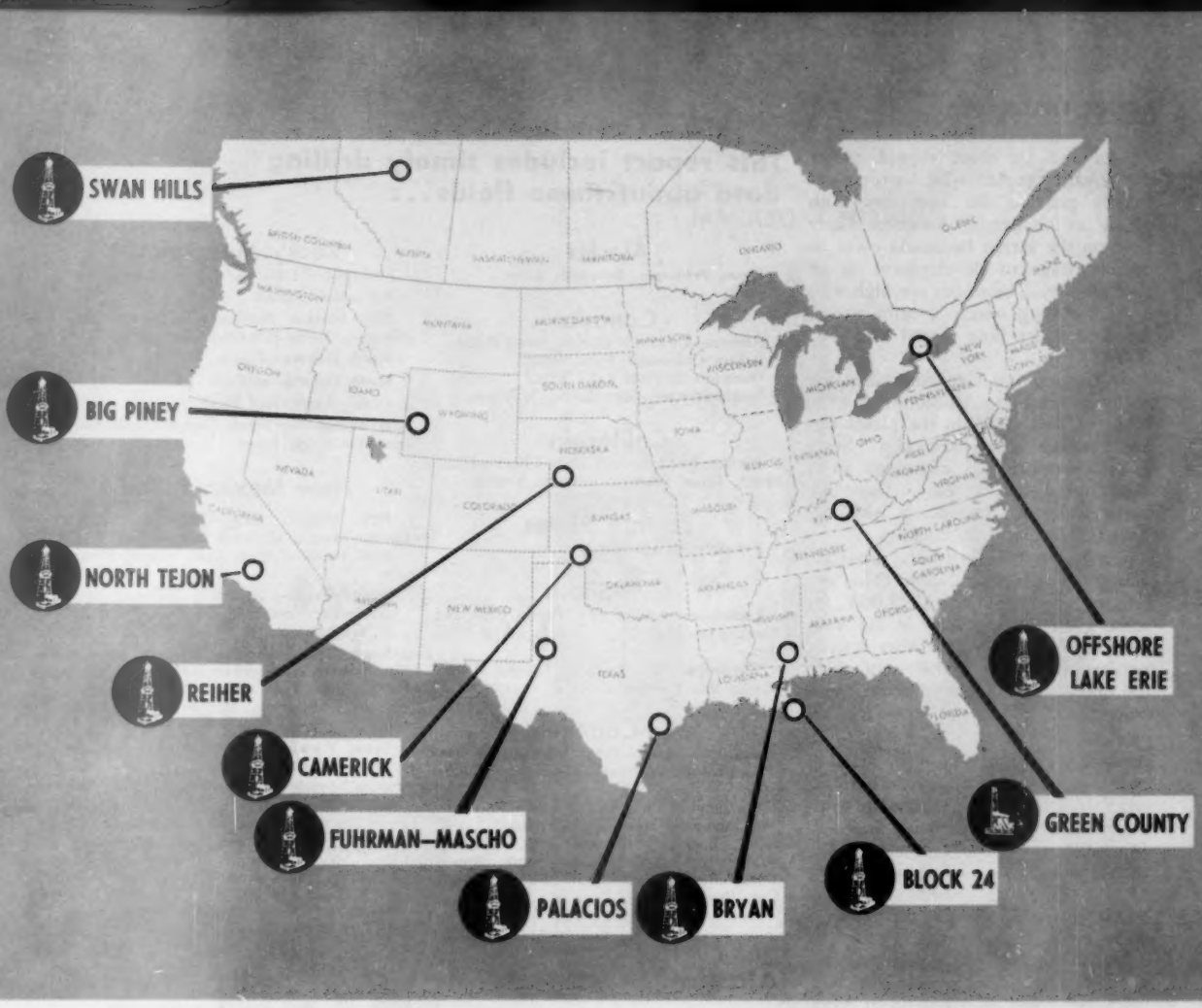

Some old, some new, but check the costs in this . . .

Active-fields drilling report

BY PETER B. BIKE
Journal Staff

HOW MUCH will it cost? This question is important to every operator, contractor, and oil company, alike. Whether a venture turns out as a well or dry hole, the financial considerations are paramount. To help analyze the factors responsible for drilling expenses, The Oil and Gas Journal surveyed more than 150 firms to obtain the drilling data presented in this report.

These drilling programs are representative of average conditions. In some areas core data are shown where available. The over-all costs, rig-time distribution, casing and mud programs, and average formation depths are good indicators in evaluating an area.

New names . . . Some areas seem perpetually active. New names continually crop up to show the diversity of programs. Perhaps the biggest news this year has been exploitation of old areas, along with development of completely wild country.

Kentucky has been a magic drawing card for operators. Cable-tool operations there have exceeded all expectations. Depending upon the locale, the pays are reached at depths varying from 250 ft. (Miss.-Ft. Payne lime) to 600 ft. (Silurian-Brassfield dolomite.) Drilling costs range from $2,500 to $4,000. A completed well costs between $5,000 and $10,000. All wells are acidized with 2,000 gal. Surface casing (7 in.) is set from 150 to 200 ft. Footage rates are $3.75; the pays are 10 to 25-ft. thick with an average porosity of 17% and permeability of 300 to 2,000 md. Over 1,100 wells have been drilled in Green County and the wildfire that was sparked has exploded into parts of 11 other counties.

Pennsylvania, offshore Lake Erie, Ohio, and New York are other areas that have enjoyed rejuvination. It is difficult to point to any single sector and accurately report on specific programs in New York and Ohio. The latter, with its success ratio of 72%, appears to justify any flurry that results. Offshore Lake Erie is one of the hottest spots going.

Alaska . . . Everything comes high in

Alaska and the sheer ruggedness of the terrain coupled with weather extremes provide the operators with plenty of challenge. Swanson River field on the Kenai Peninsula owes its current stage of development to its accessibility. The stakes are high with a well costing nearly a million dollars and a dry hole tagged at $770,000.

In neighboring Canada, things are really looking up. All along the foothills belt and east into the plains rigs are running at a brisk clip. Swan Hills operators are engrossed in a Beaverhill Lake reef play. These Alberta wells are producing with net pays of 10 to 155 ft. thick.

On the West Coast several areas are vieing for attention. North Tejon operators are spending $325,000 for some good flowing wells in the Vedder sands at 11,300 ft. Other activity persists in the Beverly Hills area where the objective is Upper Miocene sands below 7,000 ft.

Around the nation . . . Other areas of note are southern Louisiana where apparently little letup is noted in nearshore development. Bastian Bay and Block 24 are prime target for Miocene sands at depths from 5,000 to 15,000 ft. Price spreads are from $90,000 to $850,000 for flowing wells.

In the Rockies, Wyoming leads the pack in number of operations. Ventures are going in Montana at Monarch; at Lignite in North Dakota; and at North Buffalo in South Dakota. The Four Corners area continues to hold promise at Blanco and Verde.

The Mid-Continent is paced by Northwest Oklahoma, Southwest and West Kansas, and Southwest Nebraska at the Reiher field. The Sherman arch in northwestern Kansas may prove to be one of the most active areas in the state through the middle of 1960. Scattered activity currently noted is expected to snowball to greater proportions.

West Texas and the counties of eastern New Mexico are one of those perpetual situations. The custom seems to be that if the stepouts don't find it; drill deeper.

South Texas has always enjoyed a great many targets. The drillers will probably run out of names before the Frio sands run out of oil.

Mississippi, Louisiana's running mate in the Gulf South, may prove to be greatly underrrated in potential. Wells drilled in the 10,000 to 14,000-ft. range cost $100,000 to $350,000. Pricewise, considering the yields, these wells may be bargains.

This report includes timely drilling data about these fields...

Alaska

Kenai Peninsula—Swanson River.

Canada

Alberta—Cessford, Kabob, Swan Hills.
British Columbia—Fort Nelson.
Ontario—Offshore Lake Erie.
Saskatchewan—Glen Ewen, Weyburn.

California

Beehive Bend, Beverly Hills, Cheviot Hills, North Tejon, Oxnard, Ventura Avenue.

Eastern States

Pennsylvania—Benzette.

Gulf South

Louisiana—Bastian Bay, Bayou Choctaw, Black Bay, Block 24, Erath, Jennings, Minden.
Mississippi—Bryan, Little Creek, Magee, Martinville, Raleigh.

Mid-Continent

Arkansas—Sandy Bend, Stephens.
Kansas—Greenwood, Hugoton, McKinney.
Michigan—Scipio Trend.
Oklahoma—Camrick, Cherokee Trend, Knox Bromide, Laverne area, Marietta Southeast, Maysville, Mocane area, Moore, North Buffalo, North Carter, Panhandle Gas, Payne, Sho-Vel-Tum.

Rocky Mountains

Montana—Monarch.
Nebraska—Reiher.
New Mexico, Northwest—Blanco, Verde (Gallup), Verde-Horseshoe Canyon.
North Dakota—Lignite.
South Dakota—Buffalo.
Utah—Aneth, Red Wash.
Wyoming—Big Piney, Coyote Creek, Garland, La Barge, Rozet.

New Mexico-Texas

New Mexico, East—Grayburg, Jalmat, Langlie-Mattix, Maljamar.
East Texas—Linden East, Wright Mountain.
North Texas—Boonesville, Bryson area, Chico area, New Mag.-Oil Creek, Regular area, Whitesboro area.
South Texas—Humble, Lopeno, Navarro Trend, Palacios, Panther Reef, Port Acres, Port Arthur, Port Arthur-Port Acres, Red Fish Reef, Southwest Red Fish Reef, Theuvenins Creek.
Texas Panhandle—Hansford-Morrow, Panhandle East, Perryton.
West Texas—Bakke, Dune, Fuhrman-Mascho, Geraldine-Ford, Goldsmith, Hallanan, Howard Glasscock, IAB, Jo Mill, McElroy, Penwell, Puckett, Robertson, Sabre, Shafter Lake, South Kermit, Twofreds, TXL-Tubb, University-Waddell, Wasson "66" and "72" Dual.

Alaska

SWANSON RIVER, Kenai Peninsula

Pay: Hemlock, 12,000 ft.
Approx. cost of well: Flowing $950,000. Dry hole $770,000.
Cost averages: Day, with pipe $1,800

Normal Rig-Time Distribution

% on day rate	100	Total days	124
		Total bits	70

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13¾	3,000	2,000
Oil string	7	12,000	600

Typical Mud Program

Emulsion

Canada

Alberta

CESSFORD
Pay: Upper and lower Cessford (Lower Cretaceous), upper-3,000 ft., lower-3,400 ft.

Approx. cost of well: Dry hole .. $24,000 Flowing $39,400 On pump .. $47,000

Cost averages: Footage price $2.35
Day: With pipe $816; without pipe . $600

Normal Rig-Time Distribution

% on ft. rate	60	Total days	10
% on day rate	40	Total bits	6

Equipment supply center: Calgary

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	300	180
Oil string	5½	3,000-3,400	500-600

Typical Mud Program

Gel, water, sacks	80
Caustic soda, lb.	200
Quebracho, lb.	120
SAPP, lb.	200

Avg. Formation Tops (Drlg. depth, ft.)

Viking	2,700
Upper Cessford	2,950
Lower Cessford	2,350

KABOB
Pay: Beaverhill Lake, 9,900 ft.

Approx. cost of well: Flowing $180,000. Dry hole $120,000.

Cost averages: Footage price $6.75
Day: With pipe $1,100; without pipe $1,050.

Normal Rig-Time Distribution

% on ft. rate	80	Total days	45
% on day rate	20	Total bits	37

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	1,200	1,200
Oil string	5½	9,900	1,400

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Typical Mud Program
Gel, water with 5-10% oil and CMC.

Avg. Formation Tops (Drlg. depth, ft.)

Mississippian	6,100
Devonian D-1	7,300
Beaverhill Lake	9,500
Slave Point	9,800

SWAN HILLS
Pay: Beaverhill Lake (Mid-Devonian), 8,400 ft.
Approx. cost of well: Flowing $175,000. Dry hole $125,000.

Cost averages: Footage price $5.50
Day: With pipe $1,050; without pipe $1,000

Normal Rig Time Distribution

% on ft. rate	85	Total days	38
% on day rate	15	Total bits	30

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	600	600
Oil string	5½	8,400	400*

*around shoe—used staging collars and cemented 200 ft. above 2nd Specks.

Typical Mud Program
Water gel emulsion mud below 5% by volume with oil or diesel-base mud.
Serious shale sluff; experimenting with shale-resistant mud.

Average Formation Tops

2nd Specks	3,200
Blairmore	4,016
Wabamun	5,600
Beaverhill Lake	7,900
Swan Hills member of Beaverhill Lake	8,050

Note: These wells have 10-155 ft. of net pay in reef.

British Columbia

FORT NELSON AREA
Pay: Mississippian 2,000 ft.; Slave Point (Mid-Devonian) 6,500 ft.
Approx. cost of well: Flowing, Mississippian $50,000; Slave Point $250,000.
Dry hole, Mississippian $45,000; Slave Point $175,000.

Cost averages: Footage price $14.00
Day: with pipe $1,000; without pipe $900.

Normal Rig-Time Distribution

% on footage rate	66	Total days	60
% on day rate	34	Total bits	45

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	300	300
Intermediate	9⅝	1,200-2,000	600
Oil string	7	6,500	300

Typical Mud Program

Gel, sacks	1,500
Starch, sacks	150
CMC, sacks	50
Quebracho, sacks	50
Lignite, sacks	200
Lignosul fonate, sacks	50
Lime, sacks	325
Caustic, sacks	70

Avg. Formation Tops (Drlg. depth, ft.)

Mississippian	2,000
Slave Point (Middle Devonian)	6,500

Ontario

OFFSHORE LAKE ERIE
Pay: Guelph 1,400 ft.

Approx. cost of well: Flowing $35,000. Dry hole $32,000
Cost averages: Footage price .... $20-25.
Day: Without pipe $625

Normal Rig-Time Distribution

% on footage rate	80	Total days	30
% on day	20		

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	200	Drive Pipe
Intermediate	8⅝	300	Casing Shoe
Oil string	7	1,200	180

Remarks: Mostly cable-tool drilling.

Avg. Formation Tops (Drlg. depth, ft.)

Dundee	200
Bass Island	600
Guelph	1,200

Saskatchewan

GLEN EWEN
Pay: Midale limestone of Mississippian formation, 4,200 ft.

Approx. cost of well: Dry hole $25,000 Flowing $50,000 On pump $60,000

Cost averages: Footage price $2.75 - $3.00
Day: With pipe $800; without pipe $750

Normal Rig-Time Distribution

% on ft. rate	80	Total days	10
% on day rate	20	Total bits	6-8

Equipment
Fuel: Diesel. Water: River.
Supply center: Estevan.
Terrain: Rolling prairie.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	500	375
Oil string	5½	4,200	200

Typical Mud Program

Bentonite, lb.	3,000-6,000
Drilling plaster, lb.	1,500-2,000
Starch, lb.	3,000-3,500
Preservative, lb.	600-800
Bicarb, lb.	300
SAPP, lb.	300

Avg. Formation Tops (Drlg. depth, ft.)

Blairmore	2,900
Jurassic	3,300
Watrous anhydrite	3,900
Mississippian	4,100
Midale limestone	4,200

WEYBURN
Pay: Midale, 4,520 ft.

Approx. cost of well: Dry hole .. $38,000 Flowing $80,000 On pump .. $91,000

Cost averages: Footage price $3.75
Day: With pipe $800

Normal Rig-Time Distribution

% on ft. rate	80	Total days	17
% on day rate	20	Total bits	8

Equipment
Fuel: Diesel. Water: River.
Supply center: Weyburn, Sask.
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	340	225
Oil string	7	4,504	240

Typical Mud Program

Gel, lb.	2,000
Plaster, lb.	1,500
Starch, lb.	2,400

Avg. Formation Tops (Drlg. depth, ft.)

Watrous	4,072
Charles	4,352
Midale	4,352
Mission Canyon	4,413

California

BEEHIVE BEND, Glenn County
Pay: Upper Cretaceous sands, 6,500 ft.

Approx. cost of well: Flowing $130,000; dry hole $80,000.

Cost averages: Footage price $4.00
Day: With pipe $42 hour; without pipe $40 hour.

Normal Rig Time Distribution

% on footage rate	52	Total days	22
% on day rate	48	Total bits	30

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	1,500	1,000
Oil string	5½	6,500	600

Remarks: Gun or jet perforate for production.

Typical Mud Program

Gel, tons	4
Weight material, tons	50
Quebracho, ton	1
Phosphates, tons	1½
Caustic, ton	¼

Avg. Formation Tops (Drlg. depth, ft.)

Principally Upper Cretaceous sands	4,000 to 6,500

Core Data
Note: Formations generally average: 300 md. permeability, 28% porosity, and 30% total water saturation.

BEVERLY HILLS, Los Angeles County
Pay: Upper Miocene, 7,500 ft.

Approx. cost of well: Flowing $220,000

Cost averages: Day; With pipe $1,050; without pipe $990.

Normal Rig-Time Distribution

% on day rate	100%	Total days	35
		Total bits	30

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	600	450
Intermediate	11¾	3,200	550
Oil string	7	7,500	550

Remarks: Gun perforation completion.

Typical Mud Program

Clay-water, lb. cu. ft.	80
Low pH-lignite emulsion, lb. cu. ft.	95

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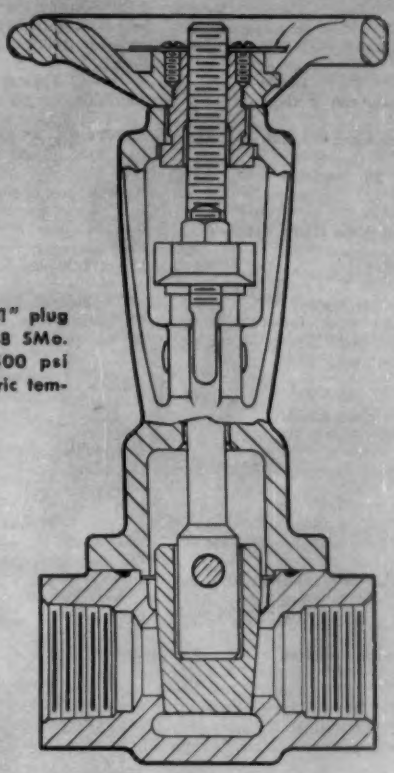

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CHEVIOT HILLS (Beverly Hills), Los Angeles County
Pay: Unnamed (Miocene), 10,000 ft.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	900	900
Intermediate	9⅝*		
Oil string	7	10,000	

*Protection string run if required.

Typical Mud Program

Clay-water to 4,000 ft. +
Low pH crude oil emulsion from 4,000 ft. + to T.D.

Avg. Formation Tops (Drlg. depth, ft.)

Top Miocene	7,000
Top Producing sand	8,500

Core Data

Formation: Prod. sand., Interval: 700 ft., 10 md. perm., 18% por., 15% resid. oil sat., and 45% tot. water sat.

NORTH TEJON, Kern County
Pay: Vedder sands, 11,800 ft.

Approx. cost of well: Flowing $325,000; Dry hole $233,000.

Cost averages: Footage price $9.25
Day: With pipe $49; without pipe $48.

Normal Rig-Time Distribution

% Footage rate	42	Total days	95
% day rate	58	Total bits	106

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	11¾	1,350	1,100
Oil string	7	11,300	4,200

Remarks. Lightweight mixes on oil string.

Typical Mud Program

Normal clay base mud .... 1,350-8,000 ft.
68-80 PCF: 45-60 Sec. vis.; 8-6 cc. water loss.
Clay base with 6-8% lease oil 8,000-9,000 ft.
76-80 PCF 45-60 vis. 4-5 cc. 9,400 ft. to total depth 90-92 PCF 80-100 vis. 3-4 cc.
Often cement 7 in. at top of zone, then change over to an oil-base mud.

Avg. Formation Tops (Drlg. depth, ft.)

Olcese sand	7,500
Basalt	9,400
Vedder sands	11,300

OXNARD, Ventura County
Pay: McInnes & Livingston, 6,500 and 9,000 ft.

Approx. cost of well: Flowing $240,000; On pump $265,000; Dry hole $175,000.

Cost averages: Footage price $29.00
Day: With pipe $1,900.

Normal Rig-Time Distribution

% footage rate	80	Total days	40
% day rate	20	Total bits	50

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	750	600
Oil string	7	9,500	300

Typical Mud Program

Emulsion lb. per cu. ft. 85

Avg. Formation Tops (Drlg. depth, ft.)

Sespe	6,500

Core Data

Formation: Sespe, 550 md. permeability, 22% porosity, 56% residual oil saturation, and 30% total water saturation. Estimated recovery: 100 bbl. per acre-ft., gas expansion.

Typical Mud Program

Emulsion, lb. per cu. ft. 85

VENTURA AVENUE, Ventura County
Pay: D-8, 12,400 ft.

Approx. cost of well: Flowing $375,000; Dry hole $200,000

Cost averages: Footage price $10.50
Day: With pipe $1,300; without pipe $1,300

Normal Rig-Time Distribution

% footage rate	80	Total days	90
% day rate	20	Total bits	110

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	525	100
Intermediate	11¾	5,500	600
Oil string	7⅝	11,400	1,000
Liner	5	12,400	....

Typical Mud Program

Clay-water, lb.	737
Oil base, bbl.	1,200

Avg. Formation Tops (Drlg. depth, ft.)

D-8	11,400
D-7	10,400
D-6	9,800

Core Data

Formation: D-8: 7.4 md. permeability, 13.8% porosity, 10% residual oil saturation, and 48% total water saturation.

Estimated Recovery (bbl. per acre-ft.)

	Water Drive
D-8	107

Eastern States

Pennsylvania

BENZETTE, Clearfield County
Pay: Oriskany, 6,800 ft.

Approx. cost of well: Flowing $98,000; Dry hole $80,000

Normal Rig-Time Distribution

% on footage rate	95	Total days	30
% day rate	5		

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	25	*35
Intermediate	9⅝	1,000	50
Gas string	7	6,750	125

*Includes cellar.

Avg. Formation Tops (Drlg. depth, ft.)

Tully	6,070
Onondaga	6,750
Oriskany	6,775

Gulf South

Louisiana

BASTIAN BAY, Plaquemines Parish
Pay: Miocene Series: J, L, N, and O sands, 14,540 ft.

Approx. cost of well: Flowing $850,000
On pump, none Dry hole $500,000

Cost averages: Footage price $5.75
Day: With pipe $1,750; without pipe $1,675

Normal Rig-Time Distribution

% on footage rate	45	Total days	45
% on day rate	55	Total bits	25

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	4,500	*1,400
Intermediate	9⅝	13,000	1,000
Oil string	7	†15,400	500

*1-1-4 Stratacrete gal. †Total depth.

Typical Mud Program

High pH lime based mud below 10,000 ft.
Maximum weight—14.5 lb. per gal.
Completion mud—Low solids CMC.

Avg. Formation Tops (Drlg. depth, ft.)

J Sand, gas	10,915
L Sand, gas	11,435
N Sand, gas	12,200
O Sand, gas	12,600

Core Data

J. Sand: Interval (ft.), 30 net sand; permeability (md.), 285; porosity (%), 29; residual gas saturation, 18; total water saturation, 53.

L. Sand: Interval (ft.), 30 net sand.

N Sand: Interval (ft.), 100 net sand; permeability (md.), 80; porosity (%), 22; residual gas saturation, 28; total water saturation, 50.

O Sand: Interval (ft.), 45 net sand; permeability (md.), 35.

Estimated recovery, M.c.f. per acre-ft.: 1,823 avg., expansion.

BAYOU CHOCTAW, Iberville Parish
Pay: Miocene sands, 6,000 to 8,500 ft.

Cost averages: Footage price $4.40
Day: With pipe $800; without pipe $700

Normal Rig-Time Distribution

% on ft. rate	75	Total days	30
% on day rate	25	Total bits	17

Equipment

Fuel: Natural gas. Water: Wells.
Supply centers: Houma; Baton Rouge.
Terrain, roads: Swampy; board roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	800-1,600	500-1,100
Oil string	7	6,000-8,000	400-500

Typical Mud Program

Barite, sacks	250-1,800
Gel, sacks	200- 150
Clays, sacks	85- 100
Chemicals, sacks	100-1,000

Note: First total of sacks is for 6,000-ft. depths; second total is for 8,000-ft. depths.

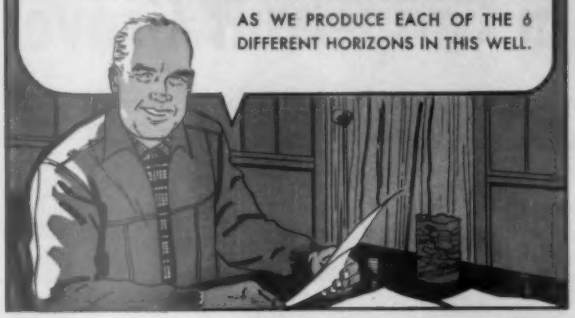
Remarks: Due to extremes in faulting, formation depths are variable.

BLACK BAY, Plaquemines Parish
Pay: 8,100 to 9,200 ft.

Approx. cost of well: Flowing $173,000

OTIS SLIDING SIDE-DOOR EQUIPMENT
WILL SAVE US SEVERAL HUNDRED DOLLARS PER ZONE

AS WE PRODUCE EACH OF THE 6 DIFFERENT HORIZONS IN THIS WELL.



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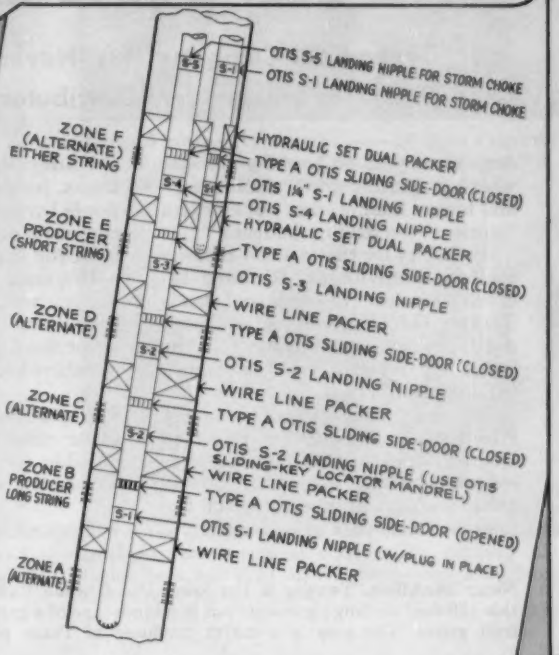
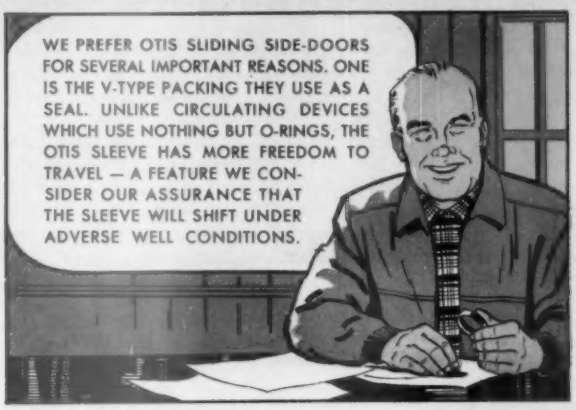
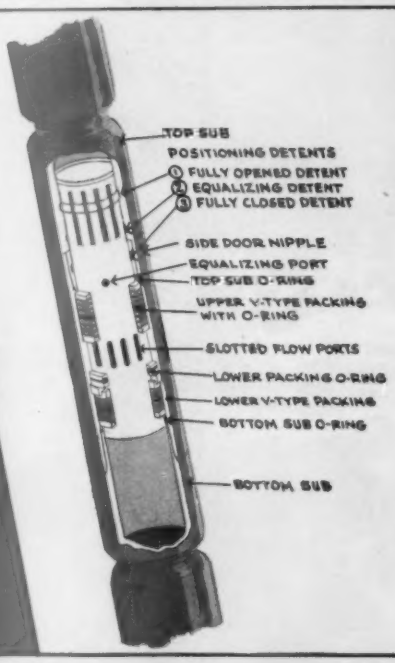

S-5
S-1
S-4
S-3
S-2
S-2
S-1
OTIS S-5 LANDING NIPPLE FOR STORM CHOKE
OTIS S-1 LANDING NIPPLE FOR STORM CHOKE
ZONE F (ALTERNATE) EITHER STRING
HYDRAULIC SET DUAL PACKER
TYPE A OTIS SLIDING SIDE-DOOR (CLOSED)
OTIS 1¼" S-1 LANDING NIPPLE
ZONE E PRODUCER (SHORT STRING)
OTIS S-4 LANDING NIPPLE
HYDRAULIC SET DUAL PACKER
TYPE A OTIS SLIDING SIDE-DOOR (CLOSED)
OTIS S-3 LANDING NIPPLE
ZONE D (ALTERNATE)
WIRE LINE PACKER
TYPE A OTIS SLIDING SIDE-DOOR (CLOSED)
OTIS S-2 LANDING NIPPLE
ZONE C (ALTERNATE)
WIRE LINE PACKER
TYPE A OTIS SLIDING SIDE-DOOR (CLOSED)
OTIS S-2 LANDING NIPPLE (USE OTIS SLIDING-KEY LOCATOR MANDREL)
ZONE B PRODUCER LONG STRING
WIRE LINE PACKER
TYPE A OTIS SLIDING SIDE-DOOR (OPENED)
OTIS S-1 LANDING NIPPLE (W/PLUG IN PLACE)
ZONE A (ALTERNATE)
WIRE LINE PACKER

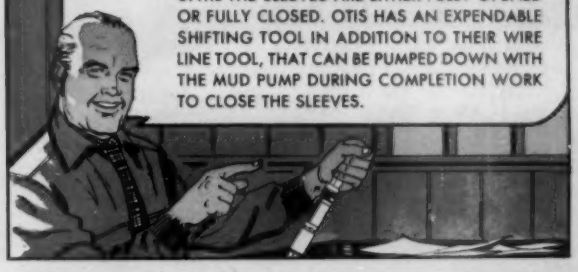
WE PREFER OTIS SLIDING SIDE-DOORS FOR SEVERAL IMPORTANT REASONS. ONE IS THE V-TYPE PACKING THEY USE AS A SEAL. UNLIKE CIRCULATING DEVICES WHICH USE NOTHING BUT O-RINGS, THE OTIS SLEEVE HAS MORE FREEDOM TO TRAVEL — A FEATURE WE CONSIDER OUR ASSURANCE THAT THE SLEEVE WILL SHIFT UNDER ADVERSE WELL CONDITIONS.



THEN THERE'S OTIS' VERTICAL SLOTTED PORT DESIGN. THIS GIVES OTIS SLIDING SIDE-DOORS MAXIMUM STRENGTH—AND ACTS TO PREVENT DISTORTION OF THE TOOLS AS THEY ARE SUBJECTED TO THE STRESS AND TORQUE OF A PRODUCTION STRING. HERE'S A DETAILED DRAWING OF THE TYPE A OTIS SLIDING SIDE-DOOR. NOTICE THE DESIGN ADVANTAGES.

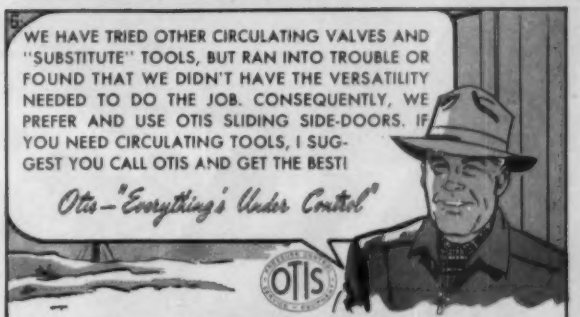


ANOTHER ADVANTAGE OF THIS OTIS EQUIPMENT IS THAT WITH THEIR SHIFTING TOOL THEY CAN OPEN AND/OR CLOSE ONE OR SEVERAL SLEEVES WITH JUST ONE TRIP OF THE WIRE LINE. AND YOU'RE SURE THE SLEEVES ARE FULLY SHIFTED, TOO. OTIS' SHIFTING TOOLS WON'T RELEASE UNTIL THE SLEEVES ARE EITHER FULLY OPENED OR FULLY CLOSED. OTIS HAS AN EXPENDABLE SHIFTING TOOL IN ADDITION TO THEIR WIRE LINE TOOL, THAT CAN BE PUMPED DOWN WITH THE MUD PUMP DURING COMPLETION WORK TO CLOSE THE SLEEVES.



WE HAVE TRIED OTHER CIRCULATING VALVES AND "SUBSTITUTE" TOOLS, BUT RAN INTO TROUBLE OR FOUND THAT WE DIDN'T HAVE THE VERSATILITY NEEDED TO DO THE JOB. CONSEQUENTLY, WE PREFER AND USE OTIS SLIDING SIDE-DOORS. IF YOU NEED CIRCULATING TOOLS, I SUGGEST YOU CALL OTIS AND GET THE BEST!

Otis—"Everything's Under Control"



OTIS ENGINEERING CORPORATION
General Offices: 6612 Denton Drive • Dallas
Branches Throughout the Oil Country

Pittsburgh Seamless Helps Texas Driller Solve Cost Squeeze In Grapefruit Grove

Texkan Oil Company Has 'Never Run Into Defects With Pittsburgh Casing,' Relies on Independent Distributor for Fast, Reliable Service

Any time you go probing for gas where grapefruit grow, tree damage and higher leasing costs put an extra "squeeze" on drilling budgets.

Authority for this is a fast-moving Dallas independent, Richard M. (Dick) Finder. He owns and heads Texkan Oil Company, a medium-sized producer now drilling in the promising Whitted Field surrounding McAllen, Texas.

Located in the middle of the Lower Rio Grande Valley (in Hidalgo County) the McAllen area is well-irrigated. Thus, its nearly 50,000 trees grow great quantities of the famous Texas pink grapefruit.

Underneath the neat rows of trees, however, are natural gas pools large enough to have made the area well-known among oilmen for the size of its reserves.

But since you can't get to the gas till you've gone through the grapefruit, you have to find a way to offset the $18 to $25 it costs to buy a matured tree.

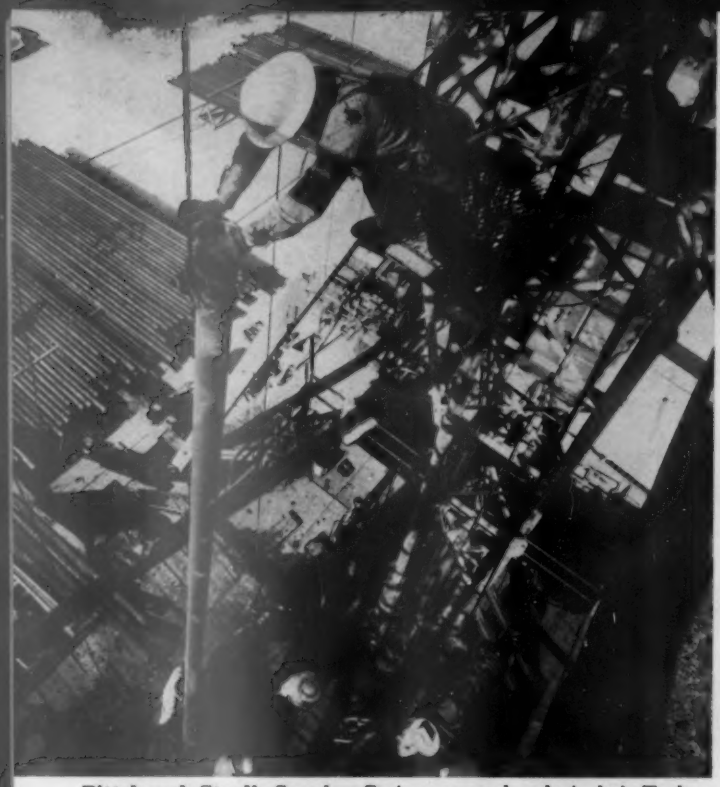
• **Three ways**—Texkan follows three rules to reduce as much as possible the financial risks of exploration and drilling:

• **Texkan uses the latest scientific testing equipment** and procedures whether there's a grapefruit grove involved or not.

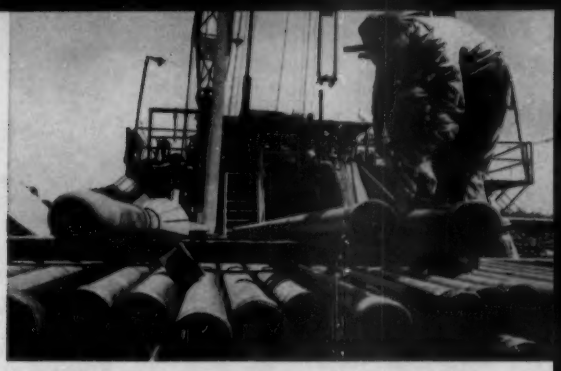
• **Texkan buys from independent oil field supply companies,** suppliers who have built their businesses by offering top quality in materials and service. Texkan knows these independents stand behind their sales.

• **Texkan insists on API quality** in the seamless steel products it uses, such as drill pipe, tubing and casing made by Pittsburgh Steel Company, one of the nation's most experienced seamless producers.

Near McAllen, Texas, in the lower Rio Grande Valley, this 129-foot drilling rig stands out in a landscape of a grapefruit grove. The area is a major producer of Texas pink grapefruit. Gas drillers must add tree damage costs to the usual heavy drilling expenses. Mature grapefruit trees are worth from $18 to $25 each.



Pittsburgh Steel's Seamless Casing was used exclusively in Texkan Oil Company's 7,500-foot well in Hidalgo County, Tex. Here, roughneck positions casing from monkeyboard on 129-foot rig.



Thread protectors must come off before casing goes to drilling platform. Texkan says it has never had defects in Pittsburgh Seamless.

Independent supplier's overnight delivery of casing kept well fully on schedule—vital if drilling costs are to be controlled.

Mr. Finder reasons that the price structure for natural gas leaves little margin to go on. So, he's got to keep drilling and exploration costs at rock-bottom.

As to choice of suppliers, Texkan's size dictates that it must have a flexible and immediate source of steel products. In times of shortages, Texkan has gotten help from the independent suppliers who know they must serve to compete.

On seamless quality, Texkan's Chief Engineer—M.D. Frazier—puts it this way:

"There's no reason for drilling, if you don't have performance from pipe. If you don't have good pipe, you have no well. We've never run into defects with Pittsburgh Steel's Seamless. Casing threads and pitch all check out and Pittsburgh Seamless is this way with consistency."

Thus, when Texkan ran 7,500 feet of casing into its eighth well in the Whitted Field, it was assured pipe to meet the area's unusually high pressure, and the knowledge that it was made by a steel producer and sold by an independent supplier who know their business because they know the oil business.

Texkan owner Richard M. Finder (left) likes the personal service he gets from independent supplier's representative, Paul Evershade.

Distributor Home Offices

Bradford Supply Company
Bradford, Pennsylvania

Buckeye Supply Company
Zanesville, Ohio

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Denver 10, Colorado

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Tulsa, Oklahoma

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Production & Refining Equipment Company
Odessa, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
Shreveport, Louisiana

Tex-Tube, Inc.
Houston 7, Texas

Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

Atlanta
Chicago
Cleveland
Dayton
Detroit
Houston
Los Angeles
New York
Philadelphia
Pittsburgh
Tulsa
Warren, Ohio

Cost averages: Footage price $3.00

Day: With pipe $1,650; without pipe $1,550

Normal Rig-Time Distribution

% on ft. rate	65	Total days	14
% on day rate	35	Total bits	8

Equipment

Fuel: Diesel. Water: Barge fresh water.
Supply center: Venica.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,500	1,600
Oil string	7	9,300	900

Typical Mud Program

Barite, sacks	75
Gel, sacks	80
Clay, sacks	40
SAPP, lb.	1,800
CMC, sacks	8

Remarks: Formations are sandy shale between sand tops.

BLOCK 24, South Pass area
Pay: Upper Miocene sands, 8,000 ft. (T.D. range 5,100 to 10,200 ft.)

Approx. cost of well:
Flowing—
5,100 ft. $90,000; 10,200 ft. $140,000
Dry hole—
5,100 ft. $55,000; 10,200 ft. $90,000

Cost averages: Footage price $3.00
Day: With pipe $1,500; without pipe $1,400

Normal Rig-Time Distribution

% on footage rate	75	Total days	10
% on day rate	25	Total bits	6

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,000	900
Oil string	7	Total depth	500

Typical Mud Program

Weighting material, sacks	2,500
Gel, sacks	200
Quebracho, sacks	100
Clay, sacks	150
SAP, sacks	50
Caustic, lb.	4,000

Core Data

Formation: Upper Miocene sands; 300 md. permeability; 32% porosity; 15% residual oil saturation; 75% total water saturation.

ERATH, Vermilion Parish
Pay: Broussard sand, 12,650 ft.

Approx. cost of well: Dry hole $175,000
Flowing $205,000

Normal Rig-Time Distribution

% on footage rate	75	Total days	28
% on day rate	25	Total bits	20

Equipment

Fuel: Gas. Water: Shallow wells.
Terrain, roads: Flat. Gravel roads. Board roads are used on lease then shelled after well is completed.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	4,500	765
Oil string	5½	12,650	230

Typical Mud Program

Weight, sacks	1,050
Gel, sacks	500
Clay, sacks	125
Caustic soda, drums	20
Quebracho, sacks	75

Avg. Formation Tops (Drlg. depths, ft.)

School Board gas sand	12,000
Derouen gas sand	12,150
Broussard oil sand	12,400

Note: These producing sands are in the Lower Miocene.

JENNINGS, Acadia Parish
Pay: 9,591-9,632 ft. Avg. TD 10,960.

Approx. cost of well: Flowing $173,000

Cost averages: Footage price $4.50
Day: $930 plus rental with pipe.

Total days (spud to rig release) 50
Total number of bits 27

Fuel: Gas. Water: Well.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	93	150
Intermediate	10¾	3,018	1,784
Oil string	7⅝	10,304	500

MINDEN, Webster Parish
Pay: Rodessa (oil) and James (gas), 6,900 ft.

Approx. cost of well: Flowing $106,000
On pump $120,000 Dry hole $60,000
Cost averages: Day: With pipe $775; without pipe $700.

Normal Rig-Time Distribution

% on day rate	100	Total days	44
		Total bits	23

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	1,000	575
Oil string	7	6,900	600

Typical Mud Program

Gel, lb.	9,600
Clay, lb.	3,000
Quebracho, lb.	2,800
Caustic soda, lb.	1,800
Barites, lb.	200,000
CMC, lb.	300
Lignite, lb.	900

Avg. Formation Tops (Drlg. depth, ft.)

Nacatoch	3,000
Lower Cretaceous	5,800
Rodessa	6,400
James	6,800

Core Data

Formation: Rodessa; interval, 16 ft.; 232 md. permeability; 23% porosity.
James; interval, 13 ft.; 121 md. permeability; 22% porosity.

Mississippi

BRYAN, Jones County
Pay: Rodessa, Sligo, Hosston; 12,000 ft.

Approx. cost of well: Flowing $226,000

Normal Rig-Time Distribution

% on footage rate	18	Total days	39
% on day rate	82		

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	1,700	375
Oil string	7	12,000	1,200

Typical Mud Program

Aquagel, lb.	62,000
Caustic soda, lb.	5,000
Quebracho, lb.	2,900
Carbonate, lb.	4,000

Avg. Formation Tops (Drlg. depth, ft.)

Paluxy	8,160
Rodessa	10,240
Sligo	10,680
Hosston	11,030

Core Data

Formation—	Perm. md.	Porosity %
Rodessa	40-250	18
Sligo	12-270	19
Hosston	5-120	15

LITTLE CREEK, Pike and Lincoln counties
Pay: Lower Tuscaloosa ("Q" sand), 10,900 ft.

Approx. cost of well: Flowing $100,000
On pump $130,000 Dry hole $70,000

Cost averages: Footage price $4.15*
Day: With pipe $1,025; without pipe $975
*Includes mud.

Normal Rig-Time Distribution

% on footage rate	85	Total days	26
% on day rate	15	Total bits	18

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	1,450	300
Oil string	5½	10,900	400

Typical Mud Program

Gel, sacks	350
Caustic, lb.	2,700
Thinners (phosphates, tannins, lignins), lb.	5,500
Water-loss agents, lb.	500

Avg. Formation Tops (Drlg. depth, ft.)

Wilcox	4,000
Top of Chalk	8,400
Lower Tuscaloosa	10,700

Core Data

Formation: Lower Tuscaloosa ("Q sand); interval, 35 ft.; 90 md. permeability; 25% porosity; 20% residual oil saturation; 70% total water saturation.

MAGEE, Smith and Simpson counties
Pay: Hosston and Sligo, 14,000 ft.

Approx. cost of well: Flowing $350,000
Dry hole $200,000

Cost averages: Footage price $6.75

Day: With pipe $1,225; without pipe $1,100

Normal Rig-Time Distribution

% on footage rate	60	Total days	75
% on day rate	40	Total bits	60

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	150	125
Intermediate	10¾	2,500	800
Oil string	7	13,000	900

Remarks: 5-in. liner set when required.

MODERN STEEL STRUCTURES FOR THE OIL INDUSTRY

Moore | LEE C. MOORE CORPORATION

BOX 216, TULSA, OKLA. : DALLAS : HOUSTON : NEW ORLEANS : CASPER : ODESSA : GREAT BEND : PITTSBURGH
EXPORT OFFICE: ROOM 624, INTERNATIONAL BLDG., 630 5TH AVE., NEW YORK 20, N. Y.
FOREIGN LICENSED MFR.: OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND

MAKE YOUR WELLS WORTH MORE

Clean Them Out With Dowell Mud Removal Agents

The first step in improving most wells is to remove mud from the well bore and the formation. This restores the original formation permeability and improves results from later treatments or production efforts.

But well conditions vary widely. The best way to clean out one well might be ineffective or unnecessarily expensive for another. That is why Dowell offers three basic mud removal agents. That's why they have developed a variety of ways to handle these materials.

In many cases where natural permeability is good, mud removal is the only treatment needed. In other cases where acidizing or fracturing is necessary, best results are usually obtained from the stimulation treatments if mud is removed first. This means that most wells are worth more as a result of Dowell mud removal treatments.

The examples on the next page show how Dowell can help solve mud removal problems. For prompt service, or detailed information on how to clean out *your* well, call your nearest Dowell representative. There are more than 165 locations to serve you in the United States,

ESTEVAN, SASKATCHEWAN, CANADA —hotspot in the cold country. Mud Acid is used regularly and successfully here to clean up wells producing from the Charles and Mission Canyon formations.

Canada, Venezuela and Argentina.
Dowell, Tulsa 1, Oklahoma.

*Dowell Trademark

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Here's Why You Have A Choice of Three Dowell Mud Removal Agents

If you need to dissolve mud filter cake —

MUD ACID may be the agent to use. It contains hydrofluoric acid, and is designed to dissolve clay minerals. It also disperses the remaining material for efficient removal from the well.

If you need to remove a lot of mud —

MUDBAN* is doing big jobs at low cost. A two per cent solution of Mudban in oil makes an efficient, low-cost mud-dispersing and suspending agent. By actual measurement, 1000 gallons of such a solution has removed as much as 15 barrels of mud.

If you need to "break down" tight limestones or dolomites —

BDA* (BREAKDOWN ACID) may be the best agent to use. This hydrochloric acid solution contains several highly efficient surfactants that improve both its penetrating and mud-dispersing qualities. When properly used, BDA will remove water blocks and prevent or break many emulsions. BDA is an excellent material to break down formations because it can be displaced into the formation at minimum pressure. This makes later treatments easier and more effective.

If you have drilled with soap-oil emulsion mud —

MUDBAN will help you avoid gelling the mud and possibly plugging the formation. Acid-base mud removal agents can create an exceedingly viscous gel which is difficult to remove. Mudban is designed to thin and disperse the mud for quick, easy removal.

If your pay is a dirty sand —

MUD ACID is designed to increase permeability by dissolving part of the clays in the formation itself. Many formations show low regular acid solubility and relatively high solubility in Mud Acid. These formations often are successfully treated with Mud Acid alone.

If your drill pipe is stuck —

MUDBAN has proved to be a real help. A two per cent solution of Mudban in oil has been found effective in shrinking and dispersing the clays responsible for the sticking. Every rig should have a supply of Mudban on hand to aid in loosening stuck pipe.

Well conditions vary widely. Your Dowell engineer has knowledge of local conditions and will study your particular well problem to help you select the proper treatment.

NOW—THE "ACID GUIDE"! NEW, IMPROVED ENGINEERING ADVANCE IN ACIDIZING. ASK YOUR DOWELL ENGINEER FOR DETAILS.

Typical Mud Program

Gel sacks	100
Barite, sacks	2,500
Barium carbonate, sacks	100
CMC, lb.	100
Q-Broxin, lb.	200
Quebracho, sacks	75
Emulsifier, sacks	40
Kylo	100

Avg. Formation Tops (Drlg. depth, ft.)

Hosston	13,700
Sligo	13,000

Core Data

Hosston formation: Interval (ft.), 30; permeability (md.), 98; porosity (%), 13.5; oil saturation (%), 20; water saturation (%), 29.

Sligo formation: Interval (ft.), 25; permeability (md.), 100; porosity (%), 13.5; oil saturation (%), 20; water saturation (%), 34.

Estimated Recovery (bbl. per acre-ft.)

	Gas exp.
Hosston	90
Sligo	120

MARTINVILLE, Simpson County
Pay: Rodessa, 12,220 ft.

Approx. cost of well: Flowing $178,000
On pump $200,000

Cost averages: Footage price $7.20

Day: With pipe $1,150; without pipe $1,060

Normal Rig-Time Distribution

% on footage rate	80	Total days	46
% on day rate	20	Total bits	77

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	80	100
Intermediate	9⅝	2,062	625
Oil string	5½	12,151	825

Avg. Formations Tops (Drlg. depth, ft.)

Rodessa	11,700
Sligo	12,300
Hosston	12,700

Core Data

Sligo formation: 15-ft. interval; 14 to 210 md. permeability; 20% porosity; estimated 200 bbl. per acre-ft., gas exp.

Hosston formation: 18-ft. interval; 74 to 82 md. permeability; 18% porosity.

RALEIGH, Smith County
Pay: Hosston, 13,025 ft.

Approx cost of well:
Flowing $275,000 single
$335,000 dual
Dry hole $175,000

Cost averages: Footage price 6.75
Day: With pipe $1,100; without pipe $900

Normal Rig-Time Distribution

% on footage rate	61	Total days	80
% on day rate	39	Total bits	56

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,200	1,200
Oil string	7	13,100	700

Typical Mud Program

Bentonite, lb.	35,500
Barite, lb.	129,000
Diesel oil, gal.	41,042
Caustic soda, lb.	11,500
CMC, lb.	4,000
Barium carbonate, lb.	10,500
Atlosol, gal.	1,980
Thinners, lb.	16,500

Avg. Formation Tops (Drlg. depth, ft.)

Selma	5,250
Lower Tuscaloosa	7,950
Base Ferry Lake Anhydrite	10,920
Hosston	11,870

Core Data

Formation—	Interval (ft.)
Hosston 12,100 sand	12,125-12,210
Hosston 12,200 sand	12,250-12,330
Hosston 12,600 sand	12,660-12,720

Mid-Continent

Arkansas

SANDY BEND, Union County
Pay: Nacotoch, 2,397 ft.

Approx. cost of well: Dry hole $6,201
On pump $16,976

Cost averages: Footage price $1.92
Hourly price $17.50

Normal Rig-Time Distribution

% on ft. rate	97	Total days	4½
% on hr. rate	3	Total bits	1

Equipment

Fuel: Electricity. Water: Creeks.
Supply center: Twenty-eight miles.
Terrain, roads: Rolling hills. Dirt roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	71	60
Oil string	4½	2,393	80

STEPHENS, Columbia County
Pay: Buckrange, 2,150 ft.

Approx. cost of well: Dry hole $5,000
On pump .. $17,000

Cost averages: Footage price $1.75
Day: With pipe $480; without pipe $430

Normal Rig-Time Distribution

% on ft. rate	95	Total days	3
% on day rate	5	Total bits	2

Equipment

Fuel is butane.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	65	50
Oil string	4½	2,150	150

Kansas

GREENWOOD, Morton County
Pay: Topeka, 3,183 ft.

Approx. cost of well: Flowing $7,648

Cost averages: Footage price $2.40
Hourly: With pipe $20; without pipe $13

Normal Rig-Time Distribution

% on ft. rate	98	Total days	8½
% on hr. rate	2	Total bits	8

Equipment

Fuel, water furnished by contractor.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Intermediate	7	700	200
Oil string	4½	3,120	100

Typical Mud Program

Mud material, sacks	236
Chemical material, sacks	20
Loss circulation material, sacks	300

Avg. Formation Tops (Drlg. depth, ft.)

Wabaunsee	2,650
Topeka	2,850
Greenwood Lansing	3,000

Remarks: Figure on approximate cost of producer is contractor cost only, as the complete cost of well is unavailable.

HUGOTON (gas), Finney County
Pay: Chase Group, 2,650 ft.

Approx. cost of well: Dry hole $14,000. Flowing $28,000.

Cost averages: Footage price $2.50
Hourly: With pipe $20; without pipe $13

Normal Rig-Time Distribution

% on ft. rate	95	Total days	5
% on hr. rate	5	Total bits	5

Equipment

Fuel: Diesel.
Water: Hauled from ponds or wells.
Supply center: Liberal (90 miles).
Terrain, roads: Level. Unimproved roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	300	200
Oil string	5½	2,650	200

Typical Mud Program

Gel, sacks	40
Salt gel, sacks	40

McKINNEY, Clark County
Pay: Mississippian, primarily; Morrow sand occasionally, 6,000 ft.

Approx. cost of well: Flowing $65,000.

Cost averages: Footage price $4.25
Day: With pipe $650; without pipe $550

Normal Rig-Time Distribution

% on ft. rate	100	Total days	24
% on day rate	...	Total bits	23

Equipment

Fuel: N-gas or butane. Water: Wells.
Supply center: Laverne (30 miles).
Terrain, roads: Slightly hilly. Roads good to fair all weather.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Intermediate	8⅝	1,200	600
Oil string	4½	TD	200

Note: Cement on intermediate is circulated to surface.

Typical Mud Program

Bentonite, sacks	50
Salt gel, sacks	200
Starch, sacks	130
Preservative, sacks	8
Lost-circulation material, sacks	90
Oil, bbl.	300

Naugatuck KRALASTIC

RUSTPROOF, CORROSIONPROOF, LIGHTWEIGHT, TOUGH, SNAKEABLE PLASTIC PIPE

and it joins with a *brush!*

No need for expensive threading operations and wrench work—no time wasted—Kralastic pipe can be joined in *seconds* by *anyone!*

Just paint mating surfaces of Kralastic pipe and fitting with a special solvent or cement—slip them together and allow them time to set, and you have made a connection as durable as the pipe itself!

And Kralastic *is* durable!

It can't rust or rot, is permanently free of electrolytic corrosion. It's unharmed by soil acids, natural gas, most chemicals. And because it's one of the toughest of all plastic materials, it resists damage from tools, rocks, and rough handling.

What's more, Kralastic pipe is flexible enough to follow uneven ground contours without costly, job-prolonging fittings. And it's easily cut with an ordinary hacksaw.

This tough rubber-resin material—one of the first to produce successful plastic pipe—has proved itself not only in natural gas lines, oil field pipe, and electrical conduit for home and industry, but in hundreds of other *tough* applications including water transmission lines.

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Remarks: Lost-circulation zones at 250-400 ft. and 4,200-4,400 ft. Some companies have had serious difficulty with lost circulation at 400 ft. However, of 13 wells drilled, lost circulation has not been a major problem.

Michigan

SCIPIO TREND, Calhoun, Jackson, Hillsdale counties

Approx. cost of well: Flowing $55,000; On pump $60,000; Dry hole $34,000

Cost averages: Footage price $550 to $600. Day: With pipe $750; without pipe $650.

Normal Rig-Time Distribution

% on footage rate	18	Total days	21
% on day rate	3	Total bits	16

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	180	250
	10	1,500	700
Oil string	7	4,250	150
or	5½	4,250	150

Typical Mud Program

Bentonite, oil, and lost-circulation materials.

Avg. Formation Tops (Drlg. Depth, Ft.)

Traverse	1,425
Niagaran	2,450
Trenton	3,750

Core Data

In 100 ft. of oil pay, est. recovery is 120 bbl./acre ft.

Oklahoma

CAMRICK, Beaver County
Pay: Purdy sand, 7,500 ft.

Approx. cost of well: Dry hole* $97,000
*Pipe set.

Cost averages: Footage price $5.25
Day: With pipe $800; without pipe $750

Normal Rig-Time Distribution

% on ft. rate	87.5	Total days	28
% on day rate	12.5		

Equipment

Fuel: Gas.
Supply center: Two miles.
Terrain, roads: Fair.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	495	....
Intermediate	9⅝	2,963	....
Oil string	5½	7,617	....

Typical mud bill averages $8,100.

Avg. Formation Tops (Drlg. depth, ft.)

Toronto lime	5,024
Checkerboard lime	5,748
Purdy sand	7,192

CHEROKEE TREND, Alfalfa County
Pay: Basal Pennsylvanian, 5,200 ft.

Approx. cost of well: Flowing $46,500; Dry hole $24,000

Cost averages: Footage price $2.70
Day: With pipe $675.; without pipe $600.

Normal Rig-Time Distribution

% on footage rate	80	Total days	18
% on day rate	20	Total bits	14

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	300	200
Oil string	4½	5,200	300

Typical Mud Program

Bentonite, sacks	50
Attapulgite, sacks	144
Salt gel, sacks	252
Starch, lb.	2,450
Preservative, lb.	100
Hulls, sacks	38
Lime, sacks	1

Avg. Formation Tops (Drlg. depth, ft.)

Layton	4,594
Des Moines	4,900
Basal Pennsylvanian	5,180
BP/Mississipian	5,240

Core Data

Formation: Basal Penn. (Red Fork; 4,959-77 ft. interval; 7.4 md. perm.; 13.1% por.; 18% resid. oil sat.; 41% total water saturation.

KNOX BROMIDE, Grady County
Pay: Second and third Bromide sands, 15,500 ft.

Approx. cost of well: Dry hole $750,000. Flowing $850,000.

Cost averages: Footage price $14
Day: With pipe $1,390; without pipe $1,140

Normal Rig-Time Distribution

% on ft. rate	33	Total days	195
% on day rate	67	Total bits	165

Equipment

Fuel: Gas. Water: Well.
Supply centers: Duncan, Lindsay.
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	3,650	2,800
Intermediate	9⅝	9,200	2,775
Oil string	7	14,800	1,200

Typical Mud Program

Barite, sacks	26,400
Bentonite, sacks	2,270
Lignite, sacks	1,280
Quebracho, sacks	344
Lost-circulation material, sacks	3,927

Avg. Formation Tops (Drlg. depth, ft.)

Sycamore	12,920
Hunton	13,370
Second Bromide	14,900
Third Bromide	15,120

LAVERNE AREA, Harper County
Pay: Hoover, Tonkawa, Chester, Morrow, 7,300 to 7,600 ft.

Approx. cost of well: Flowing $95,000
Cost averages: Footage price $5.00
Day: With pipe $850; without pipe $750

Normal Rig-time Distribution

% on ft. rate	85	Total days	25-28
% on day rate	15	Total bits	21-23

Equipment

Fuel: Gas. Water: Wells.
Supply center: One mile.
Terrain, roads: Fair.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	500	500
Intermediate	8⅝-9⅝	3,000	250
Oil string	5½-7	7,300-7,600	150

Typical Mud Program

Gel and lost-circulation material.
Cost averages $2,500 to $4,000.

Avg. Formation Tops (Drlg. depth, ft.)

Tonkawa	5,400
Hoover	4,100
Morrow	6,900
Chester	7,100

MARIETTA SOUTHEAST, Love County
Pay: Basal Oil Creek Sand, 14,200 ft.

Approx. cost of well: Flowing $504,000; Dry hole $400,000.

Cost averages: Footage price $14.50
Day: With pipe $1,450; without pipe $1,200

Normal Rig-Time Distribution

% footage rate	90	Total days	145
% on day rate	10	Total bits	121

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	1,300	800
Intermediate	9⅝	11,000	600
Oil string	5½	14,000	500

Typical Mud Program

Gel, sacks	3,350
Barite, sacks	5,500
Lignite, sacks	1,150
Oil, bbl.	700

Avg. Formation Tops (Drlg. depth, ft.)

Deese	4,800
Viola	10,800
Bromide	11,900
Oil Creek sand	14,000

MAYSVILLE, Garvin County
Pay: Upper Bromide, 6,600 ft.

Approx. cost of well: Dry hole $50,000 Flowing $70,000. On pump $80,000

Cost averages: Footage price $4.00
Day: With pipe $650; without pipe $600

Normal Rig-Time Distribution

% on ft. rate	90	Total days	30
% on day rate	10	Total bits	30

Equipment

Fuel: Pipeline gas. Water: City.
Supply center: Fifteen miles.

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	10¾	600	300
Oil string	7	6,600	250

Typical Mud Program

Gel, tons	54
Caustic, cans	28
Soda ash, bags	12
CMC, bags	5

Avg. Formation Tops (Drlg. depth, ft.)

Unconformity sand	6,090
Viola	6,100
Upper Bromide sand	6,500
First Bromide sand	6,550

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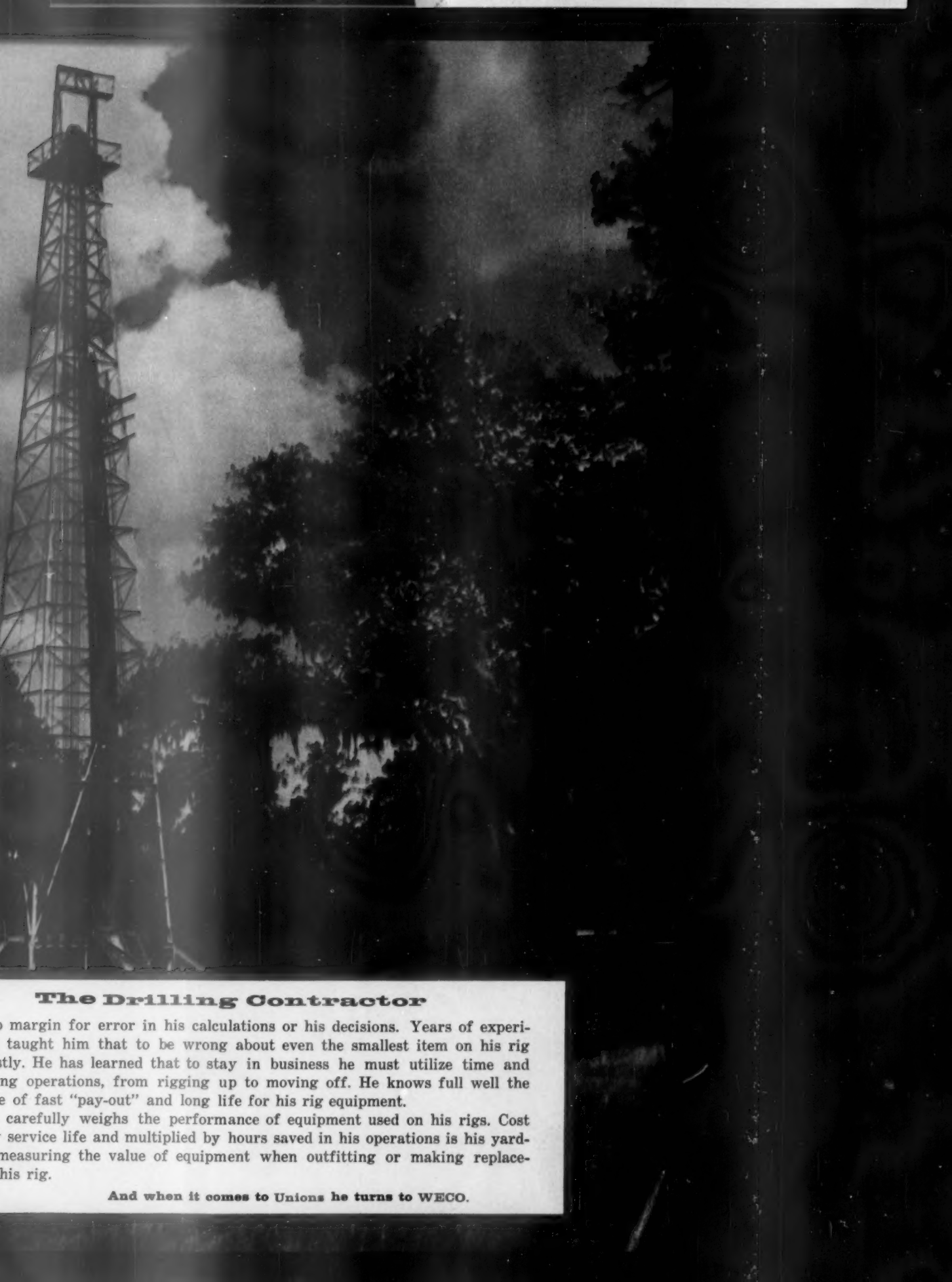

The Drilling Contractor

o margin for error in his calculations or his decisions. Years of experi- taught him that to be wrong about even the smallest item on his rig tly. He has learned that to stay in business he must utilize time and ng operations, from rigging up to moving off. He knows full well the e of fast "pay-out" and long life for his rig equipment.

carefully weighs the performance of equipment used on his rigs. Cost service life and multiplied by hours saved in his operations is his yard- measuring the value of equipment when outfitting or making replace- his rig.

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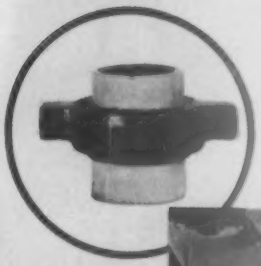

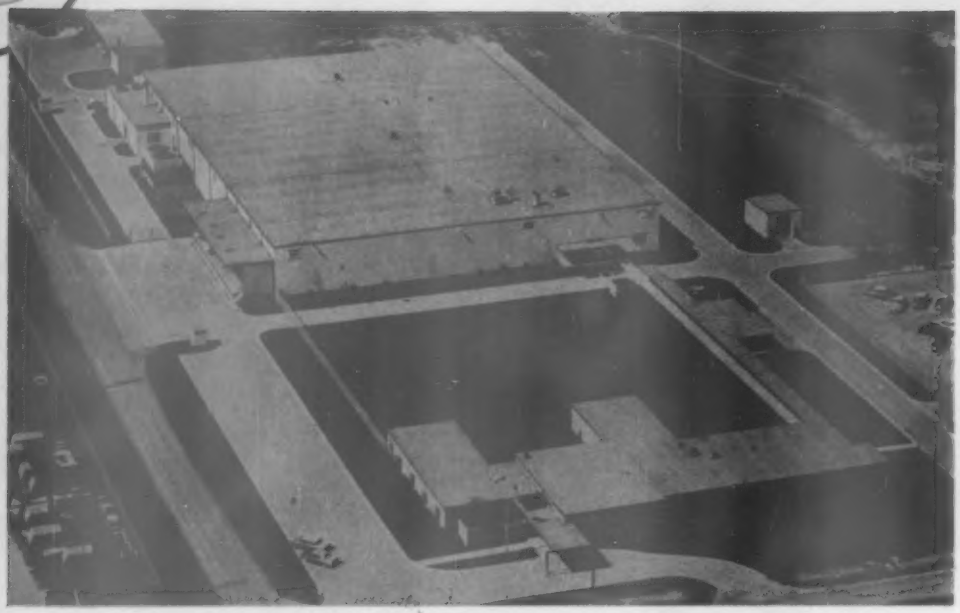

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MOCANE AREA, Beaver County
Pay: Tonkawa, Morrow, Chester, Mississippian, 7,500 ft.

Approx. cost of well: Dry hole $85,000. Flowing $125,000.

Cost averages: Footage price $5.25
Day: With pipe $700; without pipe $650

Normal Rig-Time Distribution

% on ft. rate	91.5	Total days	35
% on day rate	8.5	Total bits	30

Equipment
Fuel: Gas, LPG. Water: Well.
Supply center: Liberal, Kans.
Terrain, roads: Flat. Poor roads.

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	13⅜	550	400
Intermediate	9⅝	2,800	500
Oil string	5½	7,500	500

Note: Circulate cement on surface pipe.

Typical Mud Program

Gel, lb.	90,000
Cabonex, lb.	5,000
Soda ash, lb.	5,000
Caustic soda, lb.	4,000
Lost-circulation material, lb.	40,000

Avg. Formation Tops (Drlg. depth, ft.)

Council Grove	3,400
Tonkawa	5,500
Checkerboard	6,000
Morrow	7,000
Chester Mississippian	7,400

MOORE, Cleveland County
Pay: Hunton, 8,025 ft.

Approx. cost of well: Flowing $80,000. On pump $90,000. Dry hole $50,000.

Cost averages: Footage price $4.25
Day: With pipe $700; without pipe $600

Normal Rig-Time Distribution

% on ft. rate	95	Total days	28
% on day rate	5	Total bits	28

Equipment
Fuel: Pipeline gas.
Supply center: Ten miles.
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	10¾	900	600
Oil string	7	8,025	300

Typical Mud Program

Cuastic, cans	12
Soda ash, bags	26
Fiber bags	11
Gel, tons	27

Avg. Formation Tops (Drlg. depth, ft.)

Prue sand	7,324
Red Ford sand	7,620
Bartlesville sand	7,680
Woodford shale	7,800
Hunton lime	7,900

NORTH BUFFALO, Harper County
Pay: Lansing, Kansas City, Oswego, and Arbuckle, 7,750 ft.

Approx. cost of well: Flowing $185,000. On pump $200,000. Dry hole $85,000.

Cost averages: Footage price $7.15
Day: With pipe $785; without pipe $735.

Normal Rig-Time Distribution

% on footage rate	70	Total days	111
% on day rate	30	Total bits	53

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	13⅜	500	500
Intermediate	9⅝	4,500	800
Oil string	7	7,750	500

Typical Mud Program

Gel, tons	108
Hulls, tons	14
Wood fiber, tons	9
Soda Ash, tons	5
Lignite, tons	5
Fiber Seal, tons	5

Avg. Formation Tops (Drlg. depth, ft.)

Lansing	4,600
Kansas City	5,000
Oswego	5,400
Arbuckle	7,650

Core Data

Arbuckle: 32 ft. interval; 0.5 md. perm.; 5.36% por.; 3.84% resid. oil sat.; 64.89 total water saturation.

Arbuckle: 83 ft. interval; 0.5 md. perm.; 4.49% por.; 1.53% resid. oil sat.; 66.33 total water saturation.

Est. Rec.: bbl./acre ft.: Gas Exp. or Water Drive

Lansing 276 (Gas Exp.)
Kansas City 384 (Gas Exp.)
Oswego 88 (Gas Exp.)
Arbuckle 600 (Water Drive)

Gas pays include the Toronto, Lansing, Kansas City, Oswego, Morrow, Chester, and Viola zones.

NORTH CARTER, Beckham County
Pay: Des Moines, 9,000 ft.

Approx. cost of well: Flowing $150,000. Dry hole $83,000.

Cost averages: Footage price $6.00
Day: With pipe $1,000; without pipe $900.

Normal Rig-Time Distribution

% on ft. rate	80	Total days	50
% on day rate	20	Total bits	63

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	16	40	25
Intermediate	9⅝	780	300
Oil string	5½ or 7	9,000	200

Typical Mud Program

Gel, sacks	400
Salt gel, sacks	1,700
Emulsifier, drums	12
Q-Broxin, sacks	20
Oil, bbl.	800
Thinner, sacks	400

Average Formation Tops

Virgil	5,450
Missouri	6,700
Des Moines	8,500

PANHANDLE GAS, Texas County
Pay: Krider, 2,550 ft.

Approx. cost of well: Flowing $6,257.

Cost averages: Footage price $2.45
Day: With pipe $550; without pipe $500

Normal Rig-Time Distribution

% on ft. rate	98	Total days	5
% on day rate	2	Total bits	6

Equipment
Fuel, water furnished by contractor.

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Intermediate	7	450	250
Oil string	4½	2,540	100

Typical Mud Program

Mud material, sacks	170
Chemical material, sacks	25
Lost-circulation material, sacks	85

Remarks: Figure on approximate cost of well is contractor cost only, as the complete cost of well is unavailable.

PAYNE, McClain County
Pay: Hart, Gibson, Chimney Hill, 7,995 ft. 6,876 to 7,751 ft.

Approx. cost of well: Flowing $60,000 to $105,000.

Cost averages: Footage price $4.00
Day: With pipe $750; without pipe $650

Normal Rig-Time Distribution

% footage rate	75	Total days	38
% on day rate	25	Total bits	35

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	8⅝ to 10¾	500	400
Oil string	4½ to 5½	7,100 to 7,800	200

Typical Mud Program

Caustic soda, soda ash, gel average cost $1,900 to $5,700.

Avg. Formation Tops (Drlg. depth, ft.)

Hart	7,100
Gibson	6,876
Chimney Hill (lime)	7,705

PAYNE, McClain County
Pay: Hunton-Bromide, 9,500 to 11,000 ft.

Cost averages: Footage price $7.00
Day: With pipe $950; without pipe $850

Normal Rig-Time Distribution

% footage rate	60	Total days	80 to 110
% on day rate	40		

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	10¾	1,200	600
Intermediate	Only if lost circulation is severe		
Oil string	5½ to 7	TD	250

Typical Mud Program

Fresh water base oil $20,000 to $50,000, depending on severity of lost circulation.

Avg. Formation Tops (Drlg. depth, ft.)

Hunton	9,450
First Bromide	10,700
Second Bromide	10,850
Third Bromide	11,000

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Diamonds Mean, "Less cost per foot."

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SHO-VEL-TUM, Stephens County
Pay: Oil Creek-McLish, 8,100 ft.

Approx. cost of well: Flowing $125,000. On pump $131,000. Dry hole $75,000.

Cost average: Footage price $5.00
Day: With pipe $700; without pipe $600

Normal Rig-Time Distribution

% footage rate	90	Total days	70
% on day rate	10	Total bits	50

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	10¾	314	275
Oil string	7	6,258	250
Remarks	5½	6,190	300
	Liner	to 7,999	

Typical Mud Program

Gel, lb.	60,000
Lignite, lb.	5,000
Barite, lb.	5,000

Avg. Formation Tops (Drlg. depth, ft.)

Fusilina	3,389
Tussy	3,712
Woodford	4,226
Sylvan	5,020
McLish	7,600
Oil Creek	7,800

Rocky Mountains

Montana

MONARCH, Fallon County
Pay: Silurian and Red River (Ord.), 9,050 ft.

Approx. cost of well: On pump $185,000 Dry hole $95,000

Cost averages: Footage price $6.00
Day: With pipe $11.50; without pipe $10.50

Normal Rig-Time Distribution

% footage rate	85	Total days	35
% on day rate	15	Total bits	41

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝ or 10¾	1,000	400
Oil string	5½ or 7	9,050	650

Typical Mud Program

Salt, sacks	5,000
Starch, sacks	250
Q-Broxin, sacks	60
Nut hulls, sacks	50
Fiber, sacks	50
Oil, bbls.	500

Avg. Formation Tops (Drlg. Depth, ft.)

Silurian	8,300
Stony Mountain	8,650
Red River	8,800

Core Data

Silurian: 24 ft. interval; 0.9 md. perm.; 9.0% por.; 17% resid. oil sat.; 31% total water sat.

Est. rec. (bbl./acre-ft.): Silurian 85, Red River 105.

Nebraska

REIHER, Hitchcock County
Pay: Oread and K. C.-Lansing, 4,200 ft.

Approx. cost of well: On pump $65,000 Dry hole $19,000
Cost averages: Footage price $3.50
Day: With pipe $600; without pipe $500

Normal Rig-Time Distribution

% on day rate	11	Total bits	9

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	172	175
Oil string	5½	4,100	250

Typical Mud Program
Chemical oil emulsion

Avg. Formation Tops (Drlg. Depth ft.)

Topeka lime	3,520
Oread lime	3,613
K. C.-Lansing lime	3,680

Core Data

Oread: 3,613-33 ft. interval; 90 md. perm.; 18% por.; 35.6% resid. oil sat.; 37% total water sat.
K. C.-Lansing: 3,701-05 ft. interval; 66 md. perm.; 22% por.; 20.1% resid. oil sat.; 46% total water sat.
K. C.-Lansing: 3,824-29 ft. interval; 84 md.

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perm.; 18.9% por.; 24.6% resid. oil sat.; 48.3% total water sat.

Est. rec. bbl./acre-ft. (gas expansion) Oread 739, K. C.-Lans. 756, K. C.-Lans. 644.

New Mexico, Northwest

BIANCO, San Juan County
Pay: Mesaverde, 5,500 ft.

Approx. cost of well: Dry hole $48,000. Flowing $80,000

Cost averages: Footage price $5.00
Day: With pipe $725; without pipe $650

Normal Rig-Time Distribution

% on ft. rate	85	Total days	18
% on day rate	15	Total bits	15

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	150	150
Intermediate	7⅝	3,000	200
Oil string	5 liner	5,500	200

Remarks: Gas drill below 7⅝

Typical Mud Program

Fresh water, ft. 1,500
Gel, weight, lost circulation
Gas drill last 2,500 ft.

Avg. Formation Tops (Drlg. Depth, ft.)

Pictured Cliffs	2,600
Cliff House	4,300
Menefee	4,380
Point Lookout	4,900

VERDE - HORSESHOE CANYON, San Juan County
Pay: Gallup (Tocito), 3,000 ft.

Approx. cost of well: On pump $51,000
Cost averages: Footage price $7.00*
Day: Without pipe $300
*To T.D. with cable tools.

Normal Rig-Time Distribution

% footage rate	80 to 90	Total days	40 to 80
% on day rate	10 to 20		

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	60	100
Intermediate	Mud in 8⅝, pull after 5½-in. run.		
Oil string	5½	3,000	300 sacks in two stages

Avg. Formation Tops (Drlg. Depth, ft.)

Tocito	2,850
Siltstone marker	2,100
Point Lookout	1,400

VERDE, (Gallup), San Juan County
Pay: Lower Gallup, 3,000 ft.

Approx. cost of well: On pump $45,000 Dry hole $35,000
Cost averages: Footage price $5.50
Day: With pipe $440, without pipe $450

Normal Rig-Time Distribution

% on ft. rate	90	Total days	20
% on day rate	10	Total bits	4

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	150	100
Oil string	5½	3,000	50

Typical Mud Program

Spud mud
Water (Gel chemical while drilling pay)

Avg. Formation Tops (Drlg. Depth, ft.)

Point Lookout	900
Mancos	1,250
Gallup	2,300
Lower Gallup	2,500

North Dakota

LIGNITE, Burke County
Pay: Midale and Nesson, 6,200 ft.

Approx. cost of well: Flowing $80,000. On pump $95,000. Dry hole $70,000.

Cost averages: Footage price $4.00
Day: With pipe $850; without pipe $800

Normal Rig-Time Distribution

Total days	18
Total bits	14

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	500	450
Oil string	4½	6,200	300

Typical Mud Program

Gel, sacks	200

Average Formation Tops

Midale	6,120
Nesson	6,150

Core Data

Midale: 25 ft. interval; 1-2 md. perm.; 22% por.; 60-65% resid. oil sat.; 35-40% total water sat.
Nesson: 10 ft. interval; 10% por.

Est. rec., bbl./acre-ft.-gas expansion.

Midale	1,000
Nesson	500

South Dakota

BUFFALO, Harding County
Pay: Red River (Ordovician), 8,500 ft.

Approx. cost of well: On pump $120,000. Dry hole $60,000.

Day: With pipe $1,050; without pipe $1,000.

Normal Rig-Time Distribution

% on day rate .... 100 Total days .. 34
Total bits ... 35

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	800	400
Oil string	4½	8,500	700

Typical Mud Program

Salt, sacks	4,500
Starch, sacks	225
Q-Broxin, sacks	60
Nut hulls, sacks	50
Fiber, sacks	50
Oil, bbl.	450

Avg. Formation Tops (Drlg. Depth, ft.)

Silurian	8,100
Stony Mountain	8,350
Red River	8,500

Core Data

Red River (Ord.): 13 ft. interval; 75 md. perm.; 20% por.; 25% resid. oil sat.; 30% total water sat.

Red River	110

Utah

ANETH, San Juan County
Pay: Hermosa, 5,700 ft.

Approx. cost of well: Flowing $120,000. On pump $135,000. Dry hole $95,000.

Cost averages: Footage price $9.00
Day: With pipe $900; without pipe $825

Normal Rig-Time Distribution

% on ft. rate .... 92 Total days .. 28
% on day rate ... 8 Total bits ... 35

Equipment

Fuel: Field gas.
Water: San Juan River.
Supply center: Fifty miles to Cortez, Colo.
Terrain, roads: Rough.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	1,200	700
Oil string	7	5,700	900

Typical Mud Program

Barites, lb.	5,000
Bentonites, lb.	10,000
Preservatives, lb.	1,500
Salt water gel, lb.	5,000
Starch, lb.	10,000

Avg. Formation Tops (Drlg. Depth, ft.)

De Chelly	2,600
Organ Rock	2,700
Hermosa	4,520
Ismay	5,320
Paradox shale	5,455
Aneth	5,465
Chimney Rock	5,660
Salt	5,680

RED WASH, Uinta County
Pay: Lower Green River, 5,800 ft.

Approx. cost of well: Dry hole $85,000
On pump $125,000

Cost averages: Footage price $5.00
Day-work rate with drill pipe $825
Day-work rate without drill pipe ... $800

Normal Rig-Time Distribution

% on day rate ... 5 Total days .. 30
% on ft. rate ..... 95 Total bits ... 35

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	300	300
Oil string	5½	5,700	400

Equipment

Fuel: Lease gas.
Water: Lease system.
Supply centers: Vernal, Utah; Rangely, Colo.; Casper, Wyo.
Terrain, roads: Good.

Typical Mud Program

Bentonite, sacks	150
Caustic soda, lb.	600
Lignite, lb.	2,000
Cost approx.	$4,500

Average Formation Tops

Uinta, surface; Green River, 3,000 ft.; Wasatch, 5,750 ft.

Core Data

Green River: 4,400-5,800-ft. interval; 125 md. perm.; 16% por.; 25% resid. oil sat.; 35% total water sat.

Wyoming

BIG PINEY, Sublette County
Pay: Mesaverde, 3,265 ft.

Approx. cost of well: Flowing $45,000. On pump $60,000. Dry hole $25,000.

Cost averages: Footage price $3.75
Day-work rate with drill pipe $750.00
Day-work rate without drill pipe .. $700.00

Normal Rig-Time Distribution

% on day rate ... 10 Total days .. 21
% on ft. rate ..... 90 Total bits ... 12

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	270	250
Oil string	5½	3,238	475

Typical Mud Program

Gel, sacks	260
Barite, sacks	215
Caustic, lb.	2,500
Oil, per cent	6

Avg. Formation Tops (Drlg. Depth, ft.)

Almy	1,750
Mesaverde	3,150

Core Data

Mesaverde: 78.4 ft. interval; 12.4 md. perm.; 17.9% por.; 10.3% resid. oil sat.; 56.1% total water sat.

COYOTE CREEK, Crook County
Pay: Dakota, 6,500 ft.

Approx. cost of well: Flowing $63,000. On pump $75,000. Dry hole $30,000.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	100	85
Oil string	5½	6,500	125

Typical Mud Program

Water, ft.	500
Gel, sacks	50
Crude, bbl.	100

Avg. Formation Tops (Drlg. Depth, ft.)

Muddy	6,250
Dakota	6,500

Core Data

Dakota, 5 to 75 ft. interval; 10 to 2,500 md. perm.; 15% por.; 12.8% resid. oil sat.; 35.0% total water sat.

Est. rec. in bbl./acre-ft., gas expansion, 100; water drive, 300.

GARLAND, Big Horn County
Pay: Phosphoria-Tensleep-Amsden-Madison, 4,500 ft.

Approx. cost of well: Flowing $110,000. On pump $130,000.

Cost averages: Footage price $9.00

THIS CHIKSAN MARINE LOADING SYSTEM INCREASES FLOW CAPACITY, REDUCES OPERATING COSTS FOR UNION OIL

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Day-work rate without drill pipe . $900.00
Plus 1½ cents per foot for D.P.

Normal Rig-Time Distribution

% on ft. rate	90	Total days	40
% on day rate	10	Total bits	30

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	300	150
Oil string	7	4,500	200

Average Formation tops (Depth, ft.)

Phosphoria	3,900
Tensleep	4,000
Madison	4,400

Core Data

Phosphoria, 40 ft. interval; 20 md. perm.; 16% por.; 35% resid. oil sat.; 40% total water sat.

Tensleep, 90 ft. interval; 150 md. perm.; 16% por.; 50% resid. oil sat.; 15% total water sat.

Est. rec. bbl./acre-ft.: Phosphoria, 100; Tensleep, 100.

LA BARGE, Sublette County
Pay: First and Second Frontier, 7,000 ft.

Approx. cost of well: Dry hole $80,000. Flowing $140,000.

Cost averages: Footage price	$6.25
Day-work rate with drill pipe	$850.00
Day-work rate without drill pipe	$800.00

Normal Rig-Time Distribution

% on day rate	20	Total days	40
% on ft. rate	80		

Casing Program

	O.d. (in.)	Casing seat (ft.)
Surface	10¾	1,250
Oil string		7,000

Typical Mud Program

Gel mud . . . . . 10 to 12 lb./gal.

Average Formation tops (Depth, ft.)

Almy	Surface
Hilliard	1,200
Frontier fm.	6,000
First Frontier	6,100
Second Frontier	6,500

ROZET, Campbell County
Pay: Muddy, 7,000 ft.

Approx. cost of well: On pump $82,500. Dry hole $37,500.

Cost averages: Footage price	$3.00
Day-work rate with drill pipe	$820.00
Day-work rate without drill pipe	$735.00

Normal Rig-Time Distribution

% on ft. rate	86	Total days	12
% on day rate	14	Total bits	11

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	200	150
Oil string	5½	7,000	250

Typical Mud Program

Native mud to top of Muddy sand. Low water loss, 20% oil emulsion through pay zone.

Average Formation tops (Depth, ft.)

Muddy	6,925

Core Data

Muddy: 6,926-47 ft. interval; 26.5 md. perm.; 18.2% por.; 12.7% resid. oil sat.; 56.1% total water sat.

New Mexico, East

GRAYBURG, Eddy County
Pay: Grayburg (Premier sand), 3,540 ft.

Approx. cost of well: Dry hole $22,900. Flowing $42,300. On pump $50,800.

Cost averages: Footage price	$4.00

Normal Rig-Time Distribution

Day: Without pipe			$300
% on ft. rate	80	Total days	43
% on day rate	20	Total bits	(*)

*Cable tool.

Equipment

Fuel: Natural gas from field.
Water: Purchased 10 miles away.
Supply center: Thirty-five miles.
Terrain: Sandy.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	711	150
Oil string	7	3,475	345

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GOLDEN SCREWS

To demonstrate to you that the exclusive two-screw design is practically worth its weight in gold all Worthington QD sheaves now have two golden screws.

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WORTHINGTON

Typical Mud Program

Gel, sacks	5

Avg. Formation Tops (Drlg. Depth, ft.)

Anhydrite	428
Salt	618
Yates	1,742
Seven Rivers	2,102
Queen	2,718
Grayburg	3,130
Premier	3,428

JALMAT, Lea County
Pay: Yates sand, 3,900 ft.

Approx. cost of well: Dry hole $27,500. Flowing $55,000. On pump $62,000.

Cost averages: Footage price $3.50
Day: With pipe $600; without pipe $550

Normal Rig-Time Distribution

% on ft. rate	95	Total days	10
% on day rate	5	Total bits	8

Equipment
Fuel: Some gas available.
Water: Hauled from Eunice.
Supply center: Eunice (15 miles).
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	325	300
Oil string	5½	3,900	900

Note: Cement oil string through salt at 1,500 ft.

Typical Mud Program

Brine water to 1,800 ft.	
Magcogel, tons	2.5
My-Lo-Gel, tons	2
Defoamer, lb.	100

Avg. Formation Tops (Drlg. Depth, ft.)

Anhydrite	1,670
Base Cowden Anhydrite	3,380
Tansill	3,590
Yates	3,735

LANGLIE-MATTIX, Lea County
Pay: Queen, 3,642 ft.

Approx. cost of well: Flowing $45,395. On pump $53,500. Dry hole $27,065.

Cost averages: Footage price $3.65
Day: With pipe $650; without pipe $600.

Normal Rig-Time Distribution

% on ft. rate	95	Total days	17
% on day rate	5		

Total bits—three 12¼ in.; thirteen 7⅞ in.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	372	250
Oil string	5½	3,660	375

Typical Mud Program

Bentonite, sacks	40
Lime, sacks	5
Salt-gel, sacks	150
Starch, sacks	10
Pemam Seat, sacks	3

Avg. Formation Tops (Drlg. Depth, ft.)

Queen	3,496-3,628

MALJAMAR, Lea County
Pay: Grayburg-San Andres, 4,200 ft.

Approx. cost of well: Flowing $60,000. On pump $60,000.

Cost averages: Footage price $3.75
Day: With pipe $650; without pipe $600.

Normal Rig-Time Distribution

% on ft. rate	68	Total days	18
% on day rate	32	Total bits	8

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	235	135
Oil string	5½	4,200	850

Typical Mud Program

Salt gel, sacks	75

Avg. Formation Tops (Drlg. Depth, ft.)

Top of salt	900
Base of salt	1,900
Grayburg	3,415
San Andres	3,800

Core Data
Grayburg: 3,415 to 3,800 ft. interval; 8 md. perm.; 9% por.; 83% resid. oil sat.; 17% total water sat.
San Andres: 3,800 to 4,200 ft. interval; 5 md. perm.; 7% por.; 83% resid. oil sat.; 17% total water sat.

Est. rec. in bbl./acre-ft., 117 gas expansion (both horizons).

East Texas

LINDEN EAST, Cass County
Pay: 9,864-74, 10,254-83, 10,620-63 ft.

Approx. cost of well: Flowing $300,000. On pump $320,000. Dry hole $225,000.

Cost averages: Footage price $11.00
Day: With pipe $900; without pipe $700.

Normal Rig-Time Distribution

% on ft. rate	66	Total days	120
% on day rate	33	Total bits	120

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	392	515
Intermediate	9⅝	3,946	846
Oil string	7	10,836	....

Remarks: Use nonfluorescent oil.

Typical Mud Program
Natural and bentonite.
Oil emulsion—low solids.
Oil emulsion—low solids.

Avg. Formation Tops (Drlg. Depth, ft.)

Base Massive Anhydrite	5,778
Top Pettit	6,568
Top Cotton Valley	8,220
Top Cotton Valley lm.	10,267
Top smackover	10,725

WRIGHT MT., Smith County
Pay: Lower Pettit, 8,300 ft.

Approx. cost of well: Flowing $68,700. On pump $78,800. Dry hole $46,000.

Cost averages: Footage price $4.00
Day: With pipe $650; without pipe $400.

Normal Rig-Time Distribution

% on ft. rate	100	Total days	35
		Total bits	18-20

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	1,200	700
Oil string		TD	....

Typical Mud Program
Natural—to 1,300 ft.
Gel-Chem—to 6,500 ft.
Lime—to TD.

Avg. Formation Tops (Drlg. Depth, ft.)

Base Wilcox	1,200
Top Anhydrite	6,500
Top Pettit	8,100
Top Travis Peak	8,300

North Texas

BOONESVILLE, Wise County
Pay: Bend Conglomerate, 6,000 ft.

Approx. cost of well: Flowing $65,000. Dry hole $33,000.

Cost averages: Footage price $4.25
Day: With pipe $750; without pipe $700.

Normal Rig-Time Distribution

% on ft. rate	95	Total days	22
% on day rate	5	Total bits	25

Equipment
Fuel: Natural gas.
Water: Limited.
Supply center: Bridgeport.
Terrains, roads: Poor to rugged.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝ to 10¾	150 to 400	100 to 200
Oil string	2⅞ to 4½	6,000	200 to 350

Typical Mud Program

Gel, sacks	800
Caustic, lb.	2,000
Soda ash, lb.	2,500
Thinners, lb.	2,000

Avg. Formation Tops (Drlg. Depth, ft.)

Bryson	1,472
Brannon Bridge	1,982
Meek Bend	2,272
Gray	2,597
Bend Conglomerate	4,089

BRYSON AREA, Jack County
Pay: Bryson sand, 3,100 ft.

Approx. cost of well: Dry hole $12,000. Flowing $24,000. On pump $27,000.

Cost averages: Footage price $2.75
Hourly rate $20

Normal Rig-Time Distribution

% on ft. rate	95	Total days	6
% on hr. rate	5	Total bits	7

Equipment
Fuel: Butane or gas.
Water: Tanks.
Supply center: Graham.
Terrain, roads: Rough.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	350	125
Oil string	5½	3,100	75

Typical mud program includes $300 to $500 worth of gel, caustic, soda ash, and quebracho.

CHICO AREA, Wise County
Pay: Conglomerate, 5,900 ft.

Approx. cost of well: Dry hole $30,000. Flowing $60,000.

Cost averages: Footage price $4.00
Day: With pipe $750; without pipe $650.

Normal Rig-Time Distribution

% on ft. rate	98	Total days	18
% on day rate	2	Total bits	18

Equipment

Fuel: Natural gas.
Water: Wells.
Supply center: Bowie.
Terrain, roads: Hard-surface gravel, sand.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝-10¾	300	200
Oil string	5½	5,900	300

Typical Mud Program

Gel, sacks	375
Soda ash, sacks	8
Quebracho, sacks	8
Caustic soda, sacks	8
Lignite, sacks	16

Avg. Formation Tops (Drlg. Depth, ft.)

Brannan Bridge (LM Marker)	3,660
Caddo lime (Hundley Caddo)	5,450
Caddo Conglomerate (pay)	5,615
Bend "X" Conglomerate (pay)	5,677
Lower Bend Conglomerate (pay)	5,780

Remarks: All Conglomerates are produced as common reservoir as ruled by Railroad Commission of Texas.

NEW MAG.-OIL CREEK, Grayson County
Pay: Basal Oil Creek sand, 13,000 ft.

Approx. cost of well: Flowing $440,000. Dry hole $330,000.

Cost averages: Footage price $13.90
Day: With pipe $1,150; without pipe $950.

Normal Rig-Time Distribution

% on ft. rate	90	Total days	140
% on day rate	10	Total bits	129

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	1,400	800
Intermediate	9⅝	10,000	600
Oil string	5½	13,300	600

Typical Mud Program

Gel, sacks	2,800
Barite, sacks	4,500
Lignite, sacks	900
Lem, sacks	800
Oil, bbl.	1,000

Avg. Formation Tops (Drlg. Depth, ft.)

Atoka	8,000
Viola	9,800
Bromide	10,800
Oil Creek sand	12,900

REGULAR, Baylor County
Pay: Tannehill sand, 1,500 ft.

Approx. cost of well: Dry hole $3,700. Flowing $11,500. On Pump $13,000.

Cost averages: Footage price $1.75
Day: With pipe $550; without pipe 500.

Normal Rig-Time Distribution

% on ft. rate	75	Total days	4
% on day rate	25	Total bits	2

Equipment

Fuel: Butane.
Water: Stock tanks.
Supply center: Wichita Falls.
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝-10¾	60	40-50
Oil string	4½	1,480	75

Note: Setting through pay gives better completions.

Typical Mud Program

Gel, sacks	25
Soda ash, sacks	3

REGULAR, Wichita County
Pay: 1,570 ft. Avg. TD is 1,800 ft.

Approx. cost of well: On pump $15,000

Cost averages: Footage price $1.40
Hourly rate $20

Normal Rig-Time Distribution

% on ft. rate	99	Total days	4
% on hr. rate	1	Total bits	1

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	60	50
Oil string	4½	1,890	100

WHITESBORO AREA, Grayson County
Pay: Mississippian sand, 3,660 ft.

Approx. cost of well: Dry hole $12,810

Cost averages: Footage price $2.75
Hourly: With pipe $18; without pipe $15

Normal Rig-Time Distribution

% on ft. rate	100	Total days	9
% on hr. rate		Total bits	15

Equipment

Fuel: Butane.
Water: Creek.
Supply center: Whitesboro.
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	105	50

Typical mud program includes $618 of Baroid.

South Texas

HUMBLE, Harris County
Pay: Yegua, 5,200 ft.

Approx. cost of well: On pump $38,000
Footage price averages $2.85

Normal Rig-Time Distribution

% on ft. rate	82	Total days	17
% on day rate	18	Total bits	12

Equipment

Fuel: Natural gas.
Water: Wells.
Supply center: Houston.
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	300	....

Note: D. V. tool required at 2,400 ft.

LOPENO, Zapata County
Pay: 9,100 ft. sand, 12,349 ft.

Approx. cost of well: Flowing $510,000.
Cost averages: Day: With pipe $900
Plus 1½ cents per foot for D. P.
Without pipe $900

Normal Rig-Time Distribution

% on day rate	100	Total days	199
		Total bits	104

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	993	550
Intermediate	9⅝	7,015	600
Oil string	5½	10,387	700

Typical Mud Program

Material: Gel-clay, Quebracho-CMC, High PH lime mud.

Avg. Formation Tops (Drlg. depth, ft.)

Sparta	1,605
Queen City	2,190
Wilcox	6,700

Core Data

Formation—Wilcox. Interval (ft.)—9,130-60. Perm. (md.) 1-6. For., 11-25%. Total water sat. 50-86%.

NAVARRO TREND, Maverick, Dimmit, Atascosa, Zavalla, Frio Counties.
Pay: Olmos, 3,500 ft.
Approx. cost of well: Flowing $30,000. On pump $35,000. Dry hole $20,000.
Cost averages: Footage price $3.75
Day: With pipe $700; without pipe $600.

Normal Rig-Time Distribution

% on ft. rate	98	Total days	15
% on day rate	2	Total bits	8

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	500	500
Oil string	5½	3,500	500

Typical Mud Program

10 lb. mud to total depth.

PALACIOS, Matagorda and Calhoun counties.
Pay: Frio 8,850 ft.

Approx. cost of well: Flowing $105,000. Dry hole $70,000.
Cost averages: Footage price $2.90
Day: With pipe $875; without pipe $800.

Normal Rig-Time Distribution

% on ft. rate	75	Total days	30
% on day rate	25	Total bits	16

Equipment

Fuel: Diesel. Water: Well. Supply centers: Houston, Victoria. Terrain, roads: Fair.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	60	50
Intermediate	10¾	2,000	875
Oil string	5½	8,850	500

Typical Mud Program

Barite, sacks	3,515

Gel, sacks	27
Quebracho, sacks	135
Caustic, sacks	26
Tetraphosphate, sacks	8

Avg. Formation Tops (Drlg. depth, ft.)

Base Miocene	5,900
Frio	7,584

PALACIOS, Matagorda and Calhoun counties.
Pay: "E" Zone Frio, 9,000 ft.

Approx. cost of well: Flowing $120,000, (for dual completion)
Cost averages: Footage price $3.75
Day: With pipe $850; without pipe $795.

Normal Rig-Time Distribution

% on ft. rate	95	Total days	26
% on day rate	5	Total bits	12

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	1,060	520
Oil string	7	9,130	525

Typical Mud Program

Shale control mud system

Barite, sacks	1,300
CMC, sacks	13
Lime, sacks	50
Caustic, lb.	4,000
Gypsum, sacks	181
Q-Broxin, sacks	344

Avg. Formation Tops (Drlg. depth, ft.)

E-1	8,910
E-2	8,950
E-3	8,970
E-4	8,990
E-5	9,040

Core Data

E-5 1,798 md. perm.; 30.9% por.; 13.8% resid. oil sat.; 44.5 total water sat.
E-4 184 md. perm.; 29.3% por.; 13.4% resid. oil sat.; 53.9% total water sat.
E-3 163 md. perm.; 28.3% por.
Est. rec. in bbl./acre-ft. (gas expansion): E-5, 380; E-4, 320; E-3, 340.

PANTHER REEF, Calhoun County
Pay: Frio; 9,842 ft.

Approx. cost of well: Flowing $202,989.
Cost averages: Footage price $4.65
Day: With pipe $1,600; without pipe $1,500.

Normal Rig-Time Distribution

% on ft. rate	24	Total days	50
% on day rate	76	Total bits	13

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface cm. & 8% gel.	16	309	300
Intermediate cm. & 8% gel.	10¾	1,992	775
Oil string sls. set & 4% gel.	7	8,629	350

Remarks: 4½ liner at 9,440 ft. w/150 sacks Posmix 26 sacks Hi-Dens.

Typical Mud Program

Natural, wt. tons	622
Lime base oil emulsion, gel. tons	2.75
chem., sacks	1,046

Avg. Formation Tops (Drlg. depth, ft.)

Frio E-4	8,866

600-foot length of Thermoid-Quaker hose, self-propelled both off and on the reel, floated on inflatable rubber "sausages."

Quaker Thermoid floating ship-to-shore rig helps speed oil storage for new arctic air base

Increased air traffic over the polar route has called for an immense new airfield and oil-piping system at Frobisher Bay, Baffin Island, just completed by Foundation Company of Canada Limited.

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You do away with bulky metal drums for floating hose when you use this new Thermoid-Quaker rig. Inflatable floats take up less than a quarter of the space formerly required by floating drums. And the hose comes in such long sections that couplings are reduced by as much as 90%.

If you load or unload tankers off-shore, investigate the Thermoid-Quaker Floater Hose combinati n. Ask the Thermoid distributor, or write *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

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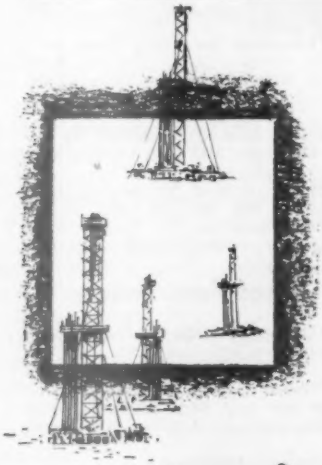

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Frio H-1 9,396
Frio H-2 9,488

PORT ACRES, Jefferson County
Pay: Hackberry, 10,700 ft.

Approx. cost of well: Flowing $234,000. Dry hole $203,000.

Cost averages: Footage price $3.25
Day: With pipe $900*; without pipe $900.
*Plus 1½ cents per ft. per day for drill pipe rental.

Normal Rig-Time Distribution

% on ft. rate	95	Total days	50
% on day rate	5	Total bits	15

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,500	Cmt. to surface
Intermediate	7	10,150*	500
Oil string	5	To TD with normal overlap in 7-in.	

*Specifically designed to provide ample strength and safety factor because of abnormal BHP.

Typical Mud Program

Depth	Weight
0-7,000	to 10.5 lb. per gal.
7,000-9,000	10.5 to 12.0 lb. per gal.
9,000-11,150	12.0 to 14.5 lb. per gal.
11,150 to TD	17.2 lb. per gal.

Avg. Formation Tops (Drlg. Depth, ft.)
Hackberry 10,400-10,700
Est. rec. bbl./acre-ft. Gas exp. or water drive. 2,458 M.c.f./acre-ft. and 86.3 bbl./acre-ft. (volumetric reservoir).

PORT ARTHUR, Jefferson County
Pay: Hackberry and Nodosaria, 12,500 ft.

Approx. cost of well: Flowing $265,000. Dry hole $230,000.

Cost averages: Footage price $3.25
Day: With pipe $900*; without pipe $900.
*Plus DP rental of 1½ cents per ft. per day

Normal Rig-Time Distribution

% on ft. rate	85	Total days	51
% on day rate	15	Total bits	14

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,500	Cmt. to surface
Intermediate	*7	10,600	500
Oil string	5 F.J. from 7 in. to TD W/Normal overlap.		

*7-in. is specifically designed to withstand excessive b.h.p. encountered.

Typical Mud Program

Depth	Weight
0-7,000 ft.	Up to 10.5 lb. per gal.
7,000-10,600	10.5 to 14.5 lb. per gal.
10,600 to TD	17.3 lb. per gal.

Avg. Formation Tops (Drlg. depth, ft.)
Het. 7,600
Hackberry 11,000
First prod. sands.
Est. rec.: 2,458 M.c.f./acre-ft. and 86.3 bbl./acre-ft., volumetric reservoir.

PORT ARTHUR-PORT ACRES, Jefferson County
Pay: Lower Hackberry-Nodosarria, 11,400 to 12,000 ft.

Approx. cost of well: Flowing $270,000. Dry hole $200,000.
Cost averages: Footage price $3.75
Day: With pipe $1,200; without pipe $1,100.

Normal Rig-Time Distribution

% on ft. rate	80	Total days	50
% on day rate	20	Total bits	20

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	2,500	2,000
Intermediate	7⅝	10,400	1,000
Oil string	5½	Liner	12,000

Typical Mud Program

13 lb. to	10,700
17 lb. to	T.D.

Avg. Formation Tops (Drlg. Depth, ft.)
Upper Frio 8,000
Lower Hackberry 10,600-11,100

Core Data
Formation—Hackberry. Perm. (md.) 200. Por. 30%. Resid. oil sat. 2%. Total water sat. 60%.

RED FISH REEF, Chambers County
Pay: Frio, 11,000 ft.

Approx. cost of well: Flowing $275,000. Dry hole $200,000.
Cost averages: Footage price $5.75
Day: With pipe $1,250; without pipe $1,150

Normal Rig-Time Distribution

% on ft. rate	80	Total days	26
% on day rate	20	Total bits	13

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	250	...
Intermediate	10¾	2,500	...
Oil string	7	9,800	...

Typical Mud Program

Bentonite, bbl.	4,000
Barite, sacks	500
Caustic soda, lb.	1,000
Quebracho, lb.	2,500
Phosphate, lb.	3,700
Lime, lb.	500

Avg. Formation Tops (Drlg. depth, ft.)
Base Miocene 6,700
Discorlis 7,135
Heterostergina 7,750
Frio 8,750

SOUTHWEST RED FISH REEF, Chambers County
Pay: Frio sands, 10,850 ft.

Approx. cost of well: Dry hole $200,000. Flowing $275,000.

Cost averages: Footage price $5.15
Day: With pipe $1,250; without pipe $1,150

Normal Rig-Time Distribution

% on ft. rate	80	Total days	50-80
% on day rate	20	Total bits	35

Equipment
Fuel: Diesel. Water: Well.
Supply center: Double Bayou.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	30	60	...
	16	250	360
Intermediate	10¾	2,500	1,500
Oil string	5½-7	TD	75

Typical Mud Program

Barite, tons	100
Gel, tons	8
Lime, sacks	500
CMC, sacks	40
Kembreak, sacks	300
Diesel oil, gal.	8,000

Avg. Formation Tops (Drlg. Depth, ft.)
Frio (F-4) 9,200
Frio (F-8) 9,744
Frio (F-11B) 10,164
Frio (F-12) 10,343
Frio (F-15) 10,700

THEUVENINS CREEK, Tyler County
Pay: 8,400 and 8,500 ft., Wilcox, Avg. 8,610 ft.

Approx. cost of well: Flowing dual $110,000 Single $90,000. Dry hole $60,000.

Cost averages: Footage price $2.65
Day: With pipe $750, without pipe $700.

Normal Rig-Time Distribution

% of ft. rate	66	Total days	33
% on day rate	34	Total bits	12

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	1,727 plus 50% stratacrete	533
Oil string	7	8,565	276

Typical Mud Program

Barite, sacks	1,203
Gel, sacks	70
Lime, sacks	3
Caustic, cans	44
Quebracho, sacks	4
Tetraphosphate, sacks	35
Q-Broxin, sacks	39
Emulsifier, sacks	32
CMC, sacks	32
Thinners, sacks	30
Diesel oil, gals.	5,860

Avg. Formation Tops (Drlg. depth, ft.)
8,400 ft. Wilcox 8,440
8,500 ft. Wilcox 8,480

Core Data
8,400 Wilcox, 8,445-60 ft. interval; 750 md. perm.; 19% por.; 7% resid. oil sat.; 35% total water sat.
8,500 Wilcox, 8,485-95 ft. interval; 1,000 md. perm.; 18% por.; 6% resid. oil sat.; 30% total water sat.
Est. recov. in bbl/acre-ft. (gas exp.): 150.

Texas Panhandle

HANSFORD-MORROW, Hansford County
Pay: 6,800-7,800 multizone, 7,800 ft.

Normal Rig-Time Distribution

% on ft. rate	97	Total days	30
% on day rate	3	Total bits	30

Equipment
Fuel: Natural gas. Water: Well.
Supply center: Borger, Pampa.
Terrain: Flat farm land.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	2,800	1,600
Oil string	4½	...	700

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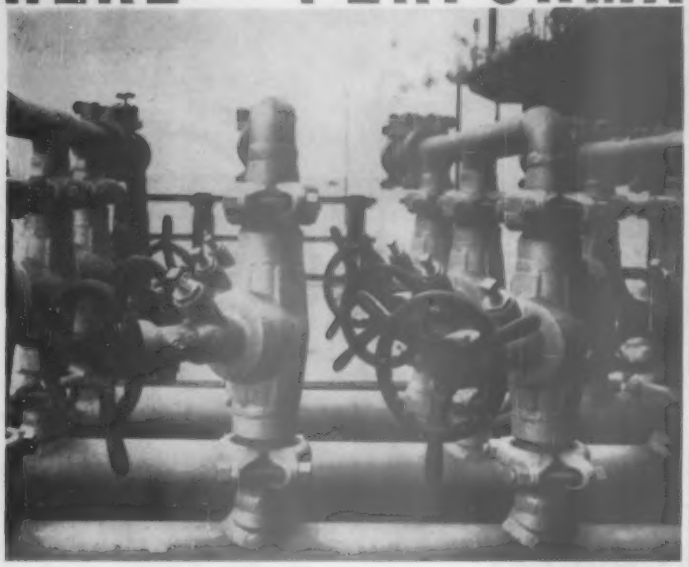

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ORBIT VALVES®

Mud program includes oil emulsion, low solid. Quantity varies because of lost returns.

Avg. Formation Tops (Drlg. Depth, ft.)

Wolfcamp	3,100
Cisco	5,000
Canyon	5,500
Strawn	6,200
Morrow	7,000
Mississippian	7,800

PANHANDLE EAST, Collingsworth County
Pay: Brown dolomite, 2,000 ft.

Approx. cost of well: Dry hole $8,000. Flowing $25,000.

Normal Rig-Time Distribution

% on ft. rate		Total days	3
% on day rate	100	Total bits	3

Equipment
Fuel: Diesel. Water: Creeks.
Supply center: Pampa.
Terrain, roads: Gentle, rolling hills, with creeks. Dirt, semi-improved roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	7-8⅝	600-800	200-500
Oil string	5½-4½	2,000	125

Avg. Formation Tops (Drlg. depth, ft.)

Panhandle limestone	1,600
Brown dolomite	2,000

Remarks: Wells are air-drilled from surface to TD.

PANHANDLE EAST, Gray County
Pay: Brown dolomite, 2,500 ft.

Approx. cost of well: Flowing $20,000.

Footage price averages $2.40

Normal Rig-Time Distribution

% on ft. rate	100	Total days	3½
		Total bits	4

Equipment
Fuel: Natural gas or butane.
Supply center: Pampa.
Terrain, roads: Rough.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	350	500
Oil string	5½	2,500	125

Typical Mud Program

Salt gel, sacks	25
Starch, sacks	50
Fiber, sacks	6
Cottonseed hulls, sacks	13

Avg. Formation Tops (Drlg. depth, ft.)

Dolomite	2,300
Granite Wash	2,400

PERRYTON, Ochiltree County

Pay: Lower Morrow sand, 8,800 ft.
Approx. cost of well: Dry hole $70,000. Flowing $120,000.

Cost averages: Footage price $5.00
Day: With pipe $825; without pipe $750.

Normal Rig-Time Distribution

% on ft. rate	95	Total days	30
% on day rate	5	Total bits	30

Equipment
Fuel: Butane, or diesel. Some gas.
Water: Wells and ponds.
Supply centers: Pampa, Borger.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	7⅝	2,900	(*)
Oil string	4½	8,800	300

*250 sacks first stage; 500 second stage.

Typical Mud Program

Bentonite gel, sacks	1,000
Fiber and hulls, sacks	700
Salt gel, sacks	50
Caustic, cans	25
Soda ash, sacks	75
Tannic product, sacks	90

Avg. Formation Tops (Drlg. depth, ft.)

Anhydrite	2,900
Douglas sand	5,300
Tonkawa sand	5,600
Cleveland sand	6,800
Atoka	7,700
Lower Morrow (Elliott sand)	8,400

West Texas

BAKKE, Andrews County
Pay: Clearfork, Wolfcamp, Pennsylvanian, Devonian, Ellenburger; Pennsylvanian 9,500 ft. Ellenburger 12,500 ft.

Approx. cost of well: Flowing $180,000. Pennsylvanian, $320,000 Ellenburger.

Cost averages: Footage price $8.75 to 12,500 ft.
Day: With pipe $1,050; without pipe $950.

Normal Rig-Time Distribution

% on ft. rate	96	Total days	90
% on day rate	4	Total bits	65

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	200	275
Intermediate	9⅝	4,800	2,200
Oil string	7 or 5½	12,500	800

Typical Mud Program

Salt-gel, sacks	50
Bentonite, sacks	800-1,200
CMC, sacks	100
Diesel oil, bbl.	300

Avg. Formation Tops (Drlg. depth, ft.)

San Andres	4,400
Wolfcamp	8,500
Pennsylvanian	9,000
Devonian	10,500
Ellenburger	12,300

Core Data
Wolfcamp, 8,500-8,600 ft. interval; 62 md. perm.; 11% por.; 12% resid. oil sat.; 38% total water sat.
Pennsylvanian, 9,000-9,200 ft. interval; 20 md. perm.; 8% por.; 8% resid. oil sat.; 46% total water sat.
Devonian, 10,450-10,600 ft. interval; 50 (frac) md. perm.; 6% por.; 25% resid. oil sat.; 25% total water sat.
Ellenburger, 12,300-12,500 ft. interval; 2 (frac) md. perm.; 2.7% por.; 11% resid. oil sat.; 45% total water sat.

DUNE, Crane County
Pay: Grayburg-San Andres, 3,400 ft.

Approx. cost of well: Flowing $44,000. On pump $48,000.

Cost averages: Footage price $3.25
Day: With pipe $650; without pipe $400.

Normal Rig-Time Distribution

% on ft. rate	97	Total days	8
% on day rate	3	Total bits	6

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	200	125
Oil string	5½	3,400	1,250

Remarks: Both casing strings circulated.

Typical Mud Program

Bentonite lb.	4,000
Salt water clay, lb.	3,200
Starch lb.	1,750
Hydrated lime, lb.	250

Avg. Formation Tops (Drlg. depth, ft.)

Yates	2,150
Grayburg	3,030
San Andres	3,190

DUNE, Crane County
Pay: San Andres, 3,600 ft.

Approx. cost of well: Flowing $43,094. On pump $52,603. Dry hole $51,128.

Cost averages: Footage price $2.85
Day: With pipe $600; without pipe $550.

Normal Rig-Time Distribution

% on ft. rate	90	Total days	9
% on day rate	10	Total bits	10

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	850	450
Oil string	5½	3,600	800

Remarks: Cement circulated on all oil strings.

Typical Mud Program
Salt water.

Avg. Formation Tops (Drlg. depth, ft.)

Rustler	1,176
Yates	2,248
Grayburg	3,148

FUHRMAN-MASCHO, Andrews County
Pay: Grayburg San Andres, 4,500 ft.

Approx. cost of well: Dry hole $30,000. Flowing $52,000. On pump $62,000.

Cost averages: Footage price $3.50
Day: With pipe $750; without pipe $700

Normal Rig-Time Distribution

% on ft. rate	80	Total days	16
% on day rate	20	Total bits	11

Equipment
Fuel: Butane. Water: Hauled in.
Supply center: Andrews.
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	...	Circulate
	9⅝		
Oil string	5½	...	250

GERALDINE-FORD, Culberson County
Pay: Delaware sand, 2,600 ft.

Approx. cost of well: Dry hole $14,000. Flowing $25,000. On pump $32,000.

Cost averages: Footage price $4.25
Day rate—cable tool $350

Normal Rig-Time Distribution

% on ft. rate ..... 90 Total days .. 20
% on day rate 10

Equipment

Fuel: Butane. Water: Trucked in.
Supply centers: Orla.
Terrain, roads: Rough.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	225	200
Oil string	...	2,600	200-400

Note: In some cases, 2,000 sacks of cement had to be run due to loss circulation or crevices.

Typical mud program includes about 2 tons of Zeogel and Fiber-Tex. Mud is used to stop cave and to keep the anhydrite from setting up in case of fishing job below the surface pipe to TD.

GOLDSMITH, Ector County
Pay zone: Grayburg, 4,700 ft.

Approx. cost of well: Flowing $41,600. On pump $52,000. Dry hole $38,400.

Cost averages: Footage price $3.50
Day: With pipe $675; without pipe $600.

Normal Rig-Time Distribution

% on ft. rate ..... 95 Total days .. 19
% on day rate 5

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	250	210
Intermediate ...	None		
Oil string	4½	4,700	1,250

Typical Mud Program

Bentonite, ... Surface to 250 ft.
Brine and drlg. soap compound ..... 250 ft. to TD.

Avg. Formation Tops (Drlg. depth, ft.)

Grayburg	4,370
Corr. Lime	4,490
Top Pay	4,560

HALLANAN (Strawn), Midland County
Pay: Pennsylvanian, 10,790 ft.

Approx. cost of well: Dry hole $100,000. Flowing $163,000. On pump $183,000.

Cost averages: Footage price $5.25
Day: With pipe $825; without pipe $750

Normal Rig-Time Distribution

% on ft. rate ..... 96 Total days .. 49
% on day rate .... 4 Total bits ... 55

Equipment

Fuel: Butane. Water: Lease well.
Supply centers: Midland, Odessa.
Terrain, roads: Level. Good roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	309	275
Intermediate ..	9⅝	4,759	2,835
Oil string	5½	10,790	400

Note: Cement circulated on salt string; not on surface string.

Typical Mud Program

Water from 0 to 10,000 ft. Low solids Driscose from 10,000 to 10,800 ft. Mud bill is approximately $2,500.

HOWARD GLASSCOCK, Howard County
Pay: San Angelo, 3,000 ft. San Andres 2,400 ft.

Approx. cost of well: On pump $30,000. Dry hole $11,000.

Cost averages: Footage price $2.80
Day: With pipe $550; without pipe $500.

Normal Rig-Time Distribution

% on ft. rate ..... 98 Total days .. 9
% on day rate .... 2 Total bits ... 8

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	160	150
Oil string	5½	T.D.	75

Remarks: Using 4½-in. also.

Typical Mud Program

Water to 2,000 ft.
Starch and preservative
Gel
Mud cost is $1,500-2,000

Avg. Formation Tops (Drlg. Depth, ft.)

Yates	1,250
San Andres	2,000
San Angelo	2,800

Core Data

San Andres, 2,170-2,286 ft. interval; 0.9 md. perm.; 10.5% por.; 10% resid. oil sat.; 61.3% total water sat.
San Angelo, 2,822-40 ft. interval; 0.6 md. perm.; 15.9% por.; 18.4% resid. oil sat.; 51.7% total water sat.
Est. rec. bbl./acre-ft.: Gas exp. or water drive. San Andres 50 (gas); 191 (water). San Angelo 102 (gas); 295 (water).

IAB, Coke County
Pay: Menielle IAB Penn Reef and Canyon sands, 5,800 ft.

Approx. cost of well: Flowing $60,750. Flowing (dual completion) $83,066.

Cost averages: Footage price $5.00
Day: With pipe $750; without pipe $650

Normal Rig-Time Distribution

% on ft. rate ..... 82 Total days 26-29
% on day rate .... 18 Total bits ... 30

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	9⅝	400	*250
Oil string	5½-7	5,900	*400

*4% gel.

Typical Mud Program

Aquagel, lb.	32,600
Man Tan, lb.	1,000
Fibertex, lb.	400
Caustic soda, lb.	1,200
Cottonseed hulls, lb.	975
Soda ash, lb.	3,700

Avg. Formation Tops (Drlg. Depth, ft.)

Canyon sand	5,100
Menielle Reef	5,425

JO MILL (Spraberry), Borden County
Pay: 7,250-7,350 ft. Avg. TD, 7,350 ft.

Approx. cost of well: Dry hole $45,000. Flowing $80,000. On pump $90,000.

Cost averages: Footage price $4.25
Day: With pipe $800; without pipe $750

Normal Rig-Time Distribution

% on ft. rate ..... 95 Total days .. 25
% on day rate .... 5 Total bits ... 29

Equipment

Fuel: Butane. Water: Local tanks.
Supply center: Snyder.
Terrain: Rolling hills and canyons.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	300	300
Intermediate ..	8⅝	3,300	500-750
Oil string	5½	7,350	250-500

Note: Clear water to core point (if cored), then oil emulsion mud to TD. If no intermediate casing is set, a salt water mud is used from 1,800 ft. to TD. Some lost circulation material is required—leather, hulls, and fiber.

Avg. Formation Tops (Drlg. Depth, ft.)

Tansill	1,400
Salt section	1,800
Yates	2,430
Top Spraberry	6,310
Lower Spraberry	6,820

McELROY, Crane County
Pay: Grayburg, 3,100 ft.

Approx. cost of well: Flowing $41,000
On pump $47,000 Dry hole $20,000

Cost averages: Footage price $3.50
Day: With pipe $650; without pipe $400

Normal Rig-Time Distribution

% on footage rate 97 Total days 7
% on day rate 3 Total bits 11

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	550	350
Oil string	5½	3,100	1,000

Typical Mud Program

Gel, sacks	75
Starch, sacks	50

Note: Spud mud for surface; clear water to 2,700 ft.; starch, brinegel, and oil through pay zone.

Avg. Formation Tops (Drlg. depth, ft.)

Yates	7,000
Grayburg	7,950

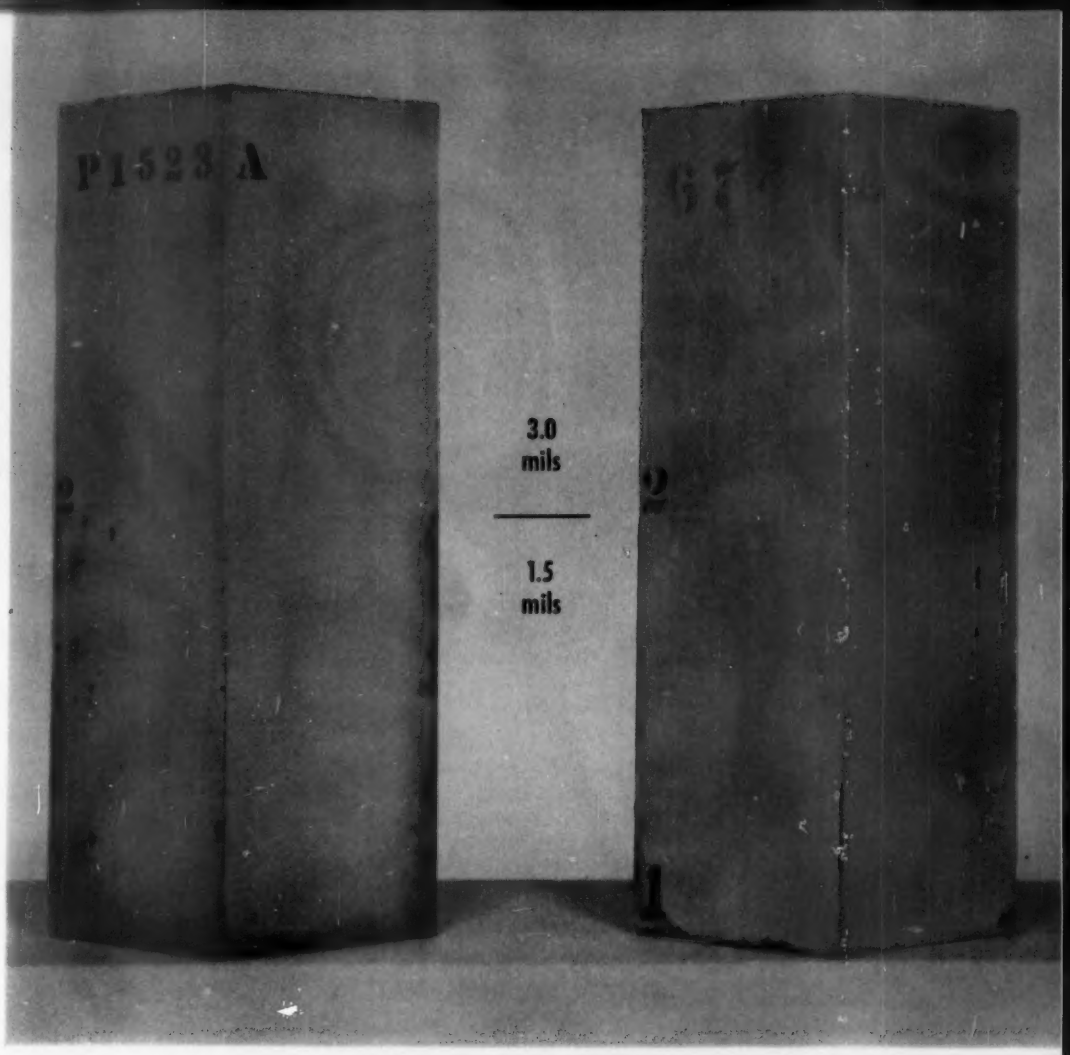
PENWELL, Ector County
Pay: San Andres, 3,700 ft.

Approx. cost of well: Flowing $42,600
Dry hole $19,700

Cost averages: Footage price $2.50
Day: with pipe $600

Normal Rig-Time Distribution

% on footage rate 87 Total days 8
% on day rate 13



Never before such durable protection, never before such lasting appearance in metal protective paints.

Proof anti-corrosion finish paints made with M50® pigment give unique freedom from bilging

Compare . . . for color . . . the gray alkyd finishes on the two exposure test angles shown above.

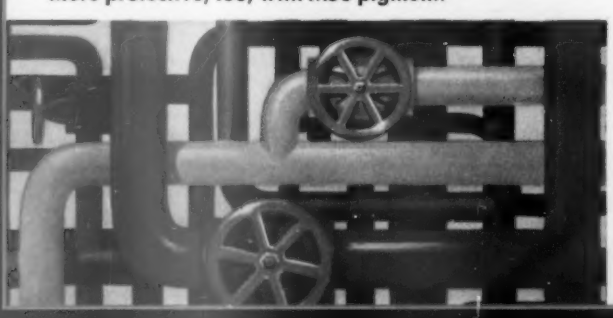
By all previous concepts for anti-corrosion paints, the one on the left should be the darker, should show some splotchiness . . . even though the paint on both angles came out of the same can. That's because the angle on the left was exposed (four years, 45°S) to the heavily sulfur-laden industrial atmosphere of Perth Amboy, N. J., while the angle on the right was exposed (four years, 45° S) only to the normal atmosphere found at National Lead's Sayville, L. I. Test Station.

As you can see, the color difference . . . bilging . . . that you might expect from SO_2-caused precipitation simply has not developed in this paint made with *M50* pigment.

Combined with its unique resistance to discoloration by the chemicals found in industrial atmospheres, fused M50 basic lead silico chromate pigment demonstrates exceptional rust inhibitive action.

Now, with *M50* pigment, your regular paint suppliers can provide standard or heavy-coat anti-corrosion primers, intermediates and finishes with superior rust inhibition, superior weather resistance, and excellent tintability. Paints that are more durable and don't bilge. The *M50* pigment is suitable for use with a wide variety of vehicles.

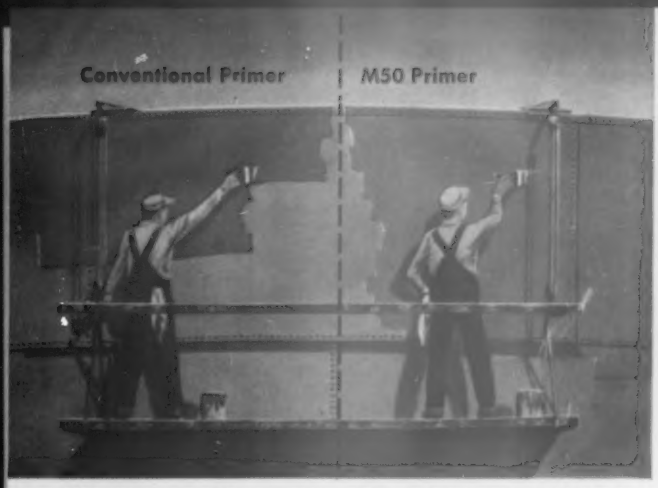
Color code paints look better longer, are more protective, too, with M50 pigment.



See, on the next page, more details . . . and how you can get these new, much more durable anti-corrosion paints.

M50 pigment is a product of National Lead Company

General Offices: 111 Broadway, New York 6, N. Y.



Weight for weight, anti-corrosion paints made with high-bulking M50 pigment cover 40% to 60% more steel.

Mil for mil, M50 paint films show better rust-inhibitive performance, lengthen the painting cycle interval.

Here's evidence M50 pigment paints reduce anti-corrosion maintenance painting costs two ways

On the preceding page you have seen evidence that *M50* pigment paints are unique among anti-corrosion paints for anti-bilging properties. Exposure tests at National Lead's Sayville, L. I. Test Station have demonstrated these metal-protective paints are also unique for their anti-corrosion action, their weather-resistance, their color stability and many other performance characteristics.

Above you see evidence that *M50* pigment paints are equally unique in their ability to provide anti-corrosion maintenance painting economy. The illustration at left gives you a visual comparison between the coverage of a conventional anti-corrosion primer and an equal weight of an *M50* counterpart of this same primer (Fed. Spec. TT-P-86a, Type I). Clearly a given weight of *M50* pigment paint goes further.

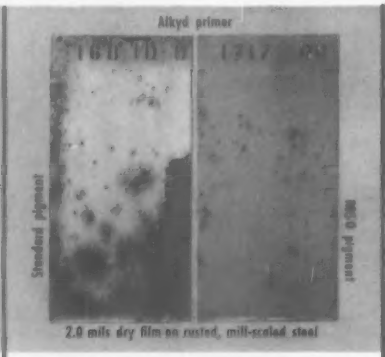
The picture at the right shows the condition of a 3-mil *M50* pigment *primer* exposed nearly 10 years *without a finish coat.* You can see that even in this severe test . . . an unprotected primer . . . anti-corrosion action is still being obtained. The repainting surface is still in good shape. Weather has not adversely affected protection. Imagine how many years of service you can anticipate from anti-corrosion *M50* finish coats applied over anti-corrosion *M50* primers in the normal or heavy coat systems!

Based on cost per sq ft per year, M50 pigment paints can greatly reduce the cost of your anti-corrosion maintenance painting.

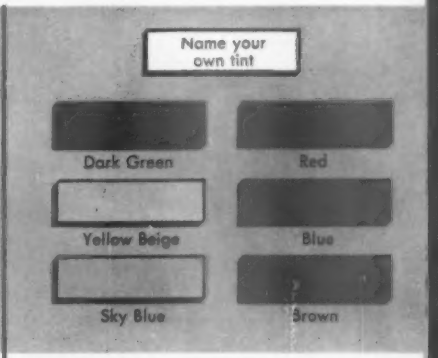
Why M50 Defense in Depth paints give anti-corrosion beyond all former concepts

1 standard pigment alkyd primer coat
2 standard pigment alkyd primer coats
Gray Alkyd Finish Coat
2 M50 pigment alkyd primer coats
1 M50 pigment alkyd primer coat

Exposed 9 years, 45°S. Each coat 1.5 mils
Proved corrosion and weather resistance



Exposed 45°S; 1 yr ind. atmos, 1 yr normal atmos.
Proved outstanding for film strength, durability



Colors above available in conventional and heavy-coat paints
A wide range of stable colors can be produced

Are you concerned with tank or structure maintenance painting in your firm? If so, you are invited: (1) to visit National Lead's Sayville, L.I. test station, where you will see the results of the 20 years research that lies behind the *M50* pigment particle and the more than 10 years of exposure testing that lies behind *M50* pigment Defense in Depth paints; (2) to send coupon below for National Lead booklet, "Defense in Depth" and typical *M50* tank paint specifications.

Next time you purchase, specify *M50* pigment paints. Any paint manufacturer can supply you.

M50 Defense in Depth

National Lead Company,
111 Broadway, New York 6, N. Y.

Gentlemen: Please send me the "Defense in Depth" booklet together with typical tank paint formulas and color chips that I can use in specifying M50-type tank paints.

Name_____ Title_____

Firm or Dept._____

Address_____

City_____ State_____

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	8⅝	750	400
Oil string	4½	3,700	900

PUCKETT, Pecos County
Pay: Devonian 10,800 ft.; Ellenburger 14,200 ft.

Approx. cost of well: Flowing $450,000
Dry hole $330,000

Cost averages: Footage price—Devonian, $7.95; Ellenburger, $10.75
Day work: With pipe, $1,000; without pipe, $900.00

Normal Rig-Time Distribution

	Devonian	Ellenburger
% on footage rate	82	87
% on day rate	18	13
Total days	119	189
Total bits	86	190

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	13⅜	1,167	900
Intermediate	9⅝	6,088	1,450
Oil string Dev.	5½	11,522	2,300
Ellen.	7	12,919	3,190

Typical Mud Program

Salt-water mud, sacks	200
Fresh-water mud, sacks	3,000

Avg. Formation Tops (Drlg. depth, ft.)

Devonian	10,500
Fusselman	10,700
Ellenburger	15,500

ROBERTSON, Gaines County
Pay: Clearfork, 6,980 ft.

Approx. cost of well: Pump $107,000

Cost averages: Footage price $5.00
Day: With pipe $700; without pipe $600

Normal Rig-Time Distribution

% on footage rate	98	Total days	30
% on day rate	2	Total bits	30

Equipment
Fuel: Lease gas.
Supply center: Hobbs, N. M.
Terrain, roads: Flat, sandy. Caliche.

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	11¾	326	*225
Intermediate	8⅝	3,128	*500
Oil string	5½	6,979	†200

*4½% gel. †Plus 200 cu. ft. strata crete No. 6.

Typical Mud Program

Gel, sacks	35
Salt gel, sacks	318
Starch, sacks	94
Lime, caustic, quebracho, sacks	*

*1 to 2 sacks each as required.

Avg. Formation Tops (Drlg. depth, ft.)

Rustler	1,850
Yates	2,930
San Andres	4,630
Glorietta	5,870
Clearfork	6,370

SABRE, Reeves County
Delaware, 3,041 ft.

Approx. cost of well: Flowing $29,519

Cost averages: Footage price $3.25
Day: With pipe $650; without pipe $600

Normal Rig-Time Distribution

% on footage rate	75	Total days	13
% on day rate	25	Total bits	8

Equipment
Fuel and water: Contractor.
Supply center: Kermit.
Terrain: Level, sandy.

Casing Program

	O.d. (in.)	Casing seat (ft).	Cement (sacks)
Surface	8⅝	416	300
Oil string	5½	3,042	375

Typical Mud Program

Magcogel, tons	1.95
Cottonseed hulls, tons	0.30
Lime, sacks	3
Salt gel, tons	2.44
My-Lo-Jel, lb.	1,700

Avg. Formation Tops (Drlg. depth, ft.)

Rustler	380
Salado	550
Castile	1,190
Lamar lime	2,905
Delaware	2,930

SHAFTER LAKE, Andrews County
Pay: San Andres, 4,650 ft.

Approx. cost of well: Dry hole $27,000
Flowing $40,000 On pump $46,000

Cost averages: Footage price $2.75
Day: With pipe $650; without pipe $600

Normal Rig-Time Distribution

% on footage rate	78	Total days	18
% on day rate	22	Total bits	13

Equipment
Fuel: Butane. Water: Contract, $450/well.
Supply center: Andrews.
Terrain: Low relief, sandy loam.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝-10⅝	210	200
Oil string	5½	4,695	250

Typical Mud Program

Gel, sacks	115
Starch, sacks	95

Salt water used from surface to 3,700 ft.

Avg. Formation Tops (Drlg. depth, ft.)

Rustler	1,960
Yates	3,060
Grayburg	4,450
San Andres	4,600

SOUTH KERMIT, Winkler County
Pay Devonian, 8,450 ft.

Approx. cost of well: Dry hole $116,500
Flowing $166,000

Cost averages: Footage price $7.10
Day: With pipe $950; without pipe $850

Normal Rig-Time Distribution

% on footage rate	93	Total days	38
% on day rate	7		

Equipment
Fuel: Natural gas. Water: Shallow wells.
Supply center: Kermit (3 miles).
Terrain, roads: Good.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	900	500
Intermediate	9⅝	3,700	1,400
Oil string	5½-7	8,450	500

Typical Mud Program

Barite, tons	29
Bentonite, tons	21
Caustic, quebracho, tons	3
CMC, soda ash, tons	1.5
Brine (to 3,800 ft.), bbl.	3,250

Avg. Formation Tops (Drlg. depth, ft.)

Yates	2,500
San Andres	3,800
Mississippian	7,550
Devonian	8,350
Silurian	8,540

TWOFREDS, Ward and Loving counties
Pay: Delaware sand, 4,700 to 4,950 ft.

Approx. cost of well: Dry hole $27,000
Flowing $50,000 On pump $61,000

Cost averages: Footage price $4.00
Day: With pipe $700; without pipe $650

Normal Rig-Time Distribution

% on footage rate	95	Total days	15
% on day rate	5	Total bits	11

Equipment
Fuel: Butane. Water: Well.
Supply center: Kermit.
Terrain, roads: Sand. Caliche roads.

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	525	175
Oil string	5½-4½	TD	150

Typical Mud Program

Salt gel, sacks	30
Starch, sacks	30
Oil, bbl.	50

Drill with fresh water or brine to pay.

Avg. Formation Tops (Drlg. depth, ft.)

Rustler	1,200
Castile	4,650
Delaware lime	4,680
Delaware sand	TD

TXL-TUBB, Ector County
Pay: Tubb sand, 6,350 ft.

Cost averages: Footage price $4.50
Day: With pipe $725; without pipe $675.

Normal Rig-Time Distributions

% on footage rate	83	Total days	28
% on day rate	17	Total bits	26

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	8⅝	1,425	700
Oil string	5½	6,425	400

Typical Mud Program

Gel, sacks	25
Starch, sacks	45
Crude oil, bbl.	400

Avg. Formation Tops (Drlg. depth, ft.)

Red Bed	90-100
San Andres	4,110
Glorietta	5,150

Expect more
from a FAILING slim hole rig and . . . get it!
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Today's Best Equipment to find Tomorrow's Oil!
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ACTIVE FIELDS

Clearfork 5,474
Tubb 6,022

UNIVERSITY-WADDELL, Crane County
Pay: Devonian, 9,400 ft.

Approx. cost of well: Flowing $190,000
On pump $202,000

Cost averages: Footage price $7.50
Day: With pipe $912; without pipe $823.

Normal Rig-Time Distribution

% on footage rate	67	Total days	63
% on day rate	33	Total bits	39

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	900	900
Intermediate ...	9⅝	3,600	2,000
Oil string	7	9,400	850

Remarks: Cement circulated on surface and inter. strings.

Typical Mud Program

Gel, sacks 50
Caustic, lb. 500
Quebracho, lb. 500
Lease oil, bbl. 500
Fresh water.

Avg. Formation Tops (Drlg. depth, ft.)

Rustler 1,050
Grayburg 3,026
Pennsylvanian 7,591
Devonian 8,588

WASSON "66" AND "72" DUAL, Gaines and Yoakum counties
Pay: Upper and Lower Clearfork (Permian), 7,600 ft.

Approx. cost of well: Flowing $125,000
Dry hole $65,000 On pump $160,000

Cost averages: Footage price $4.75
Day: With pipe $750; without pipe $675

Normal Rig-Time Distribution

% on footage rate	90	Total days	22
% on day rate	10	Total bits	30

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	380	450
Intermediate ...	9⅝	3,300	1,400
Oil string	7	7,200	700

Remarks: Two strings of tubing.

Typical Mud Program

(Oil-water emulsion)
Gel, sacks 70
Emulsifier, sacks 75
Starch, sacks 90
Minor amounts of other materials including small amount of oil.

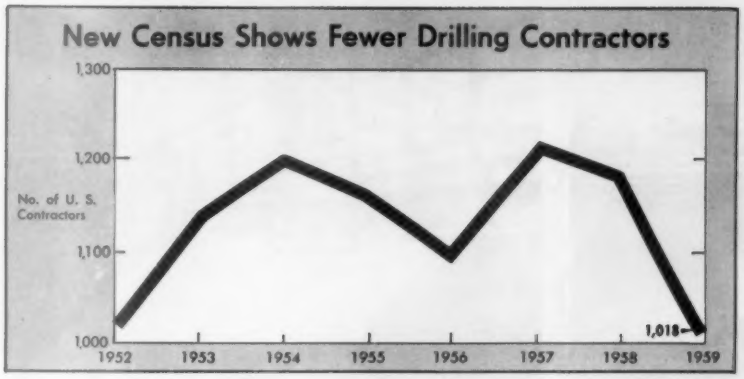
Avg. Formation Tops (Drlg. depth, ft.)

Yates 2,950
San Andres 4,350
Upper Clearfork 6,350
Lower Clearfork 7,150

Core Data

UCF formation: Gross interval, 300 ft.; permeability, 10 md.; porosity, 6%; residual oil saturation, 75%; total water saturation, 25%.

LCF formation: Gross interval, 400 ft.; permeability, 10 md.; porosity, 6%; residual oil saturation, 75%; total water saturation, 25%.



More contractors quit business

• New study shows that more than 150 contractors have dropped out in the past year, with biggest proportion among the smaller one and two-rig companies. Canada has fewer contractors, too.

THE SLOWDOWN in domestic drilling activity during the 1958 recession year is showing up clearly in the smaller number of drilling contractors doing business this year.

The Oil and Gas Journal's 1959 census of drilling contractors shows there are 1,018 rotary drilling contractors in the nation, compared with 1,187 last year, a drop of 169.

The biggest decrease was among the smaller contractors, although the number of large contractors also dropped.

Last year, there were 673 contractors owning one or two rigs. This year's census shows only 547. The contractors in this category own about 21% of the nation's contractor rigs.

In 1958, there were 14 contractors owning 20 or more rigs each. This year there are only 13 in this class. Last year there were 39 contractors owning 10 to 19 rigs, and this year there are only 35.

The 1,018 contractors reporting in this year's census said they owned 3,596 rotary rigs. Last year, the contractors reported 3,981 rigs. The census is confined to contractors and

BY ROBERT B. BIZAL
Editorial Research Director

doesn't reflect the number of rigs owned by producers.

Nor does it involve cable tools. About 135 of the contractors own a total of 230 cable-tool rigs in addition to their rotary rigs.

About 30 of the contractors, accounting for 532 of the rigs, have 45 rigs in Canada and 159 in foreign service, either directly or under subsidiaries.

The number of people on drilling-contractor payrolls dropped from 62,908 last year to 53,951 this year. There were 3,189 tool pushers last year, compared with 2,971 this year.

Decrease in Canada

The drop in Canada was even greater than in the U. S. The number of contractors was down only 14% in the U. S., compared with 25% in Canada.

The 61 contractors in Canada own 324 rigs. Last year there were 82 contractors with 333 rigs. The concentration is in Calgary, where 48 contractors have main offices. Nine contractors work out of Edmonton.

So far this year, operators in western Canada have completed 1,791 wells. This is just slightly below last year's figure of 1,811.

U. S. Activity Up

While there are fewer rigs and contractors in this year's survey, there is actually more drilling activity in the U. S. this year than last.

In 1958, U. S. operators completed only 49,111 wells, compared with 53,838 the previous year and 58,160 the year before that.

To Sept. 26 this year, U. S. operators have completed 36,860 wells, compared with only 35,018 for the same period last year. There were 2,132 active rotary rigs in the U. S. September 21, compared with 2,059 at the same time last year.

Copies of the census report on drilling contractors may be obtained by writing Industry Census Department, The Oil and Gas Journal, Box 1260, Tulsa.

SIZES OF U. S. DRILLING-CONTRACTOR FIRMS

No of contractors	No. of rigs per company	Total rigs owned by group	Per cent of total rigs owned
13	20 or more	488	13.5
35	10 to 19	464	13
90	6 to 9	625	17
333	3 to 5	1,248	35
547	1 or 2	771	21.5
1,018		3,596	100

HOME OFFICES OF DRILLING CONTRACTORS

City and state—	No. of contractors	No. of rigs
California:		
Bakersfield	22	52
Los Angeles-Long Beach	40	227
Others	1	1
Illinois:		
Various locations	57	119
Kansas:		
Wichita	43	90
Others	37	85
Louisiana:		
New Orleans	13	40
Shreveport	24	97
Others	31	107
Oklahoma:		
Oklahoma City	46	160
Tulsa	65	502
Others	66	176
Rocky Mountains:		
Denver	33	123
Others	52	152
Texas:		
Abilene	31	87
Albany-Breckenridge area	18	42
Alice	14	36
Amarillo-Borger-Pampa	15	48
Corpus Christi	17	55
Fort Worth-Dallas	61	274
Houston	63	256
Kilgore-Longview-Tyler	24	102
Midland-Odessa	48	225
San Antonio	18	50
Wichita Falls	61	204
Others	60	134
Other states	58	152
Total	1,018	3,596

Process water is deoiled . . .

and mixed with bay water as

Humble attacks pollution at Baytown

PART 2 OF TWO PARTS

BY LARRY RESEN
Refining Editor

CONSIDERABLE effort and expense has been expended to improve existing equipment and install new items to reduce contamination at Humble's Baytown refinery.

One project, for instance, was the modification of the sewer-separator system. A total of $1,369,000 was spent on improvement to sewers and separators, including the installation of the preseparation flumes. The major expenditure in this program was made to provide one main oil-water separator which can handle all of the water effluent in an efficient manner.

An early installation provided continuous skimming and sediment-removal facilities. A later change in 1956 provided adjustable overflow weirs along the entire length of the discharge ends of each of the four main compartments. Installation of the weirs in place of the four small gates previously used improved distribution between the four compartments and minimized channeling through the separator.

The improved retention time cuts the quantity of oil discharged to the outfall canal during rain storms. The preseparator flumes reduce the loss of volatile material to the air and results in the collection of 500-1,000 bbl. per day of dry oil suitable for rerun distillation with only a brief period of cold settling.

Electrical coalescers . . . Treating facilities formerly consisted primarily of a large number of 10 by 30-ft. settling drums. As the refinery grew and the volume of material to be treated increased, settling times became inadequate and it became necessary in many cases to operate several drums in parallel. It also became necessary to install booster pumps between stages in multistage operations, to stay within the very low allowable working pressures on the settling drums.

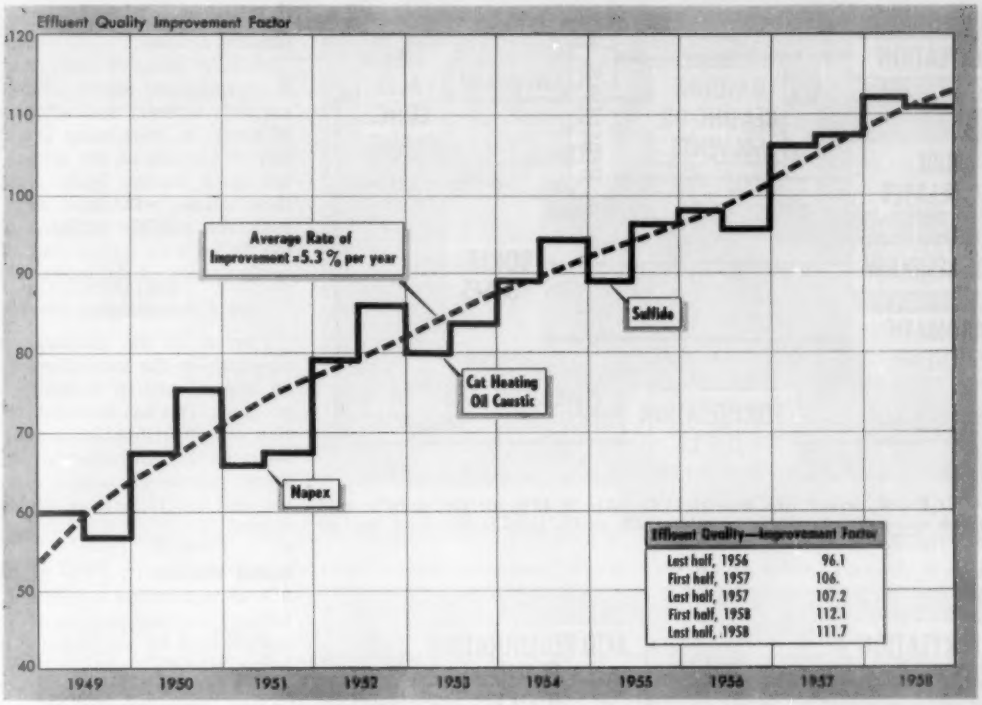
This led to rather complex operations that required considerbale attention from operating personnel. In addition, the carryover of treating chemicals was high, so the treating operations were a major contributor to effluent problems.

Installation of electrical coalescers following essentially all chemical-treating and water-washing operations has been quite effective in reducing carryover of treating agents. This has resulted in a very marked reduction in the biochemical oxygen demand (BOD) of the effluent water. Another benefit is that less treating chemicals are needed.

A good example of the advantages of the coalescer operation is the caustic-wash unit processing catalytic heating oil. The treating agent is 50° Be caustic. This unit consisted of two 10 by 30-ft. caustic-settling drums in parallel followed by two 10 by 30-ft. water-settling drums in parellel. Charge rates ranged from 20,000 to 40,000 bbl. per day, giving rates of 10,000 to 20,000 bbl. per day through each drum.

A 5 vol. % caustic wash was followed by a 15 vol. % water wash. Caustic was recirculated until the strength dropped below 40° Be, when it was discarded. Water was discharged directly to the sewer after being used once-through. The rates through the settling drums was well within established limits but the carryover of caustic which was removed by the water wash often reached 20,000 lb. per day.

The high carryover was partly because organic acids form a complex in the presence of strong caustic which is present as a third phase in-



EFFLUENT QUALITY has increased steadily since the program started in 1949. Quality is now considerably higher than the goal set at the beginning of the program. Fig. 1.

termediate in gravity to the caustic and the heating oil.

The four settling drums were converted to electrical coalescers by the installation of horizontal electrodes which cause the oil-caustic or oil-water mixture to pass through a direct current field. The water or caustic droplets become charged and are attracted to each other whereupon they coalesce and become large enough to settle readily.

This operation reduced the caustic carryover to a maximum of 400 lb. per day—a 98% reduction. Water content of the final product was reduced to the point that it was possible to eliminate a clay straining step.

Better processes . . . Some of the largest beneficial effects from an effluent improvement standpoint were achieved by using better processes which often completely eliminated sources of contaminants. Since these improved processes had economic justification, their cost is not included in the expenditures for effluent improvement.

These improved processes include hypochlorite sweetening in place of doctor sweetening, Hydrofining in place of acid-treating fuel products and lube oils, and substitution of clay treating for acid treating of aromatics.

A tower deasphalting unit has been installed to replace several mixer-settler units for deasphalting and deresining lube oils fractions. It has been possible to reduce acid consumption for lube treating from 60-70 tons per day to 15 tons per day. Desulfurization units have been installed to handle virgin naphthas which previously had been caustic-washed.

Transition . . . During the postwar years, improvement in quality of the refinery effluent has averaged 5.3% per year. To measure effluent improvement, a weighted index termed the effluent quality-improvement factor (EQIF) is used. This factor is based on the difference between the quality of the effluent at the start of the program and the goals that were set. This means that the EQIF became 100% when the goals were reached, and that effluent quality higher than the original goals will produce factors above 100%.

Problem Periods

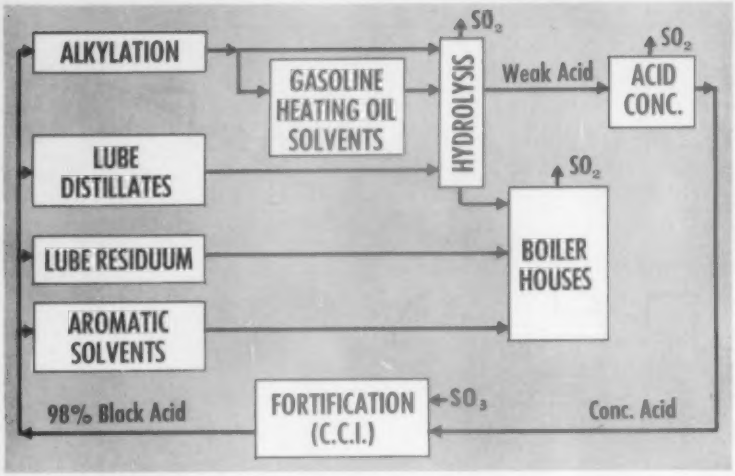
Although the improvement in effluent quality has maintained an overall upward trend, there have been three notable periods when the average quality of the effluent was below the average improvement curve. These periods are designated on Fig. 1 as "napex," catalytic-heating-oil caustic, and sulfides.

Napex . . . Early in 1951 the Napex treating process for lube oils was placed in operation. This process made use of spent caustic containing aromatic sulfonates to neutralize acid-treated lube stocks. Use of this type of caustic effected a marked improvement in lube-oil processing. Unfortunately, the spent caustic from this operation was a very effective emulsifying agent and discharge of this material to the sewer system had a detrimental effect on the quality of the refinery effluent.

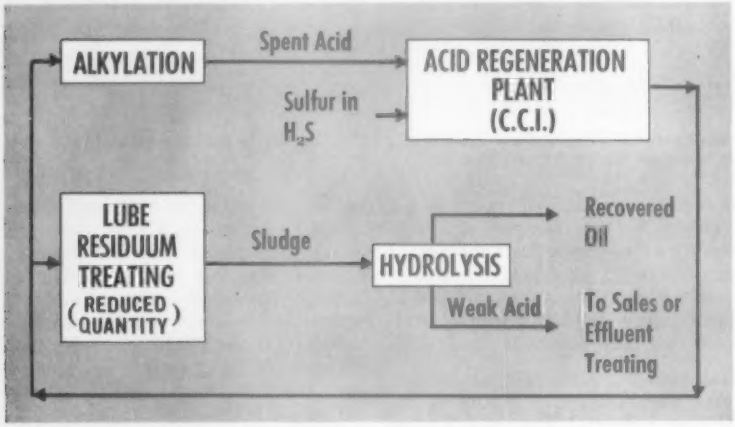
Attempts to process this material by flocculation were unsuccessful because it formed a very sticky floc which became a viscous mass on settling. Finally, a pretreatment process was developed for the spent solution whcih consisted of acidification to liberate organic matter, followed by prolonged settling. The acid-water phase was then successfully clarified, and the hydrocarbon phase was burned at a boilerhouse.

As little as 5-10 gal. per day of this hydrocarbon would completely upset the flocculation operation. A sharp improvement in effluent quality at the end of 1951 reflected the successful application of the pretreatment technique. Installation of a lube Hydrofiner in 1955 eliminated acid treating of the lube stocks with its associated problems of air and water contamination.

Catalytic-heatnig-oil caustic . . . During the winter of 1952-53 it became necessary to treat catalytic heating



PLANT ACID FLOW looked like this in 1951. About 45% of the sulfuric acid entering the refinery was decomposed to SO_2 which was released to the atmosphere. Fig. 2.



REVISED ACID FLOW shows greatly reduced use of acid and substitution of white acid, rather than refortified black acid. Fig. 3.

oil with 50° Be caustic in order to meet quality specifications. This operation replaced a 10° Be caustic wash. The resultant increased carryover of strong caustic containing organic acids into the water wash had a very detrimental effect on effluent quality. Also storage facilities for spent caustic from this operation—discharged on a batch basis after being spent to 40° Be—were inadequate and operations were upset a number of times by a slug of this strong phenolic caustic.

The installation of electrical coalescer facilities in 1955 eliminated the carryover problem. A sales outlet has since been developed for the phenolic strong caustic.

Sulfides . . . The period marked "sulfide" on Fig. 1 reflects a period of poor operation and excessive downtime on the first sour-water stripper. This resulted in the installation of the new tower and spare pumps to insure the highest possible service factor.

These setbacks to Humble's effluent improvement program show how effluent problems may arise with little or no warning. The spent Napex problem was solved by a considerable amount of research work but with essentially no capital investment, since existing facilities were used. The caustic-carryover problem was solved by installing a better piece of equipment —electrical coalescing rather than gravity settling.

Since the coalescers afford a satisfactory return on the investment, the cost of this item is not considered a part of the cost of the effluent improvement program. The additional sour-water stripping facilities required a capital investment of $175,000 which is included in the cost of the program since the unit's sole function is to improve the quality of the refinery effluent.

Another phase of study in progress is an ecolgoical survey of the Houston ship channel and adjacent bays. Bioassays or tests using live fish are run on samples of the refinery effluent on a routine basis. Data from these studies will serve as a sound basis for making decisions concerning the need for further improvements in the quality of the refinery effluent.

Air Contamination Prevention

Control of the discharge of contaminants to the atmosphere has been an integral part of Humble's over-all program. This has included the reduction of sulfur dioxide emitted to the atmosphere, construction of smokeless flares, control of catalyst dust to the air, and containment of hydrocarbon vapors.

Sulfur Dioxide . . . The problems of SO_2 contamination is inherent in any refinery charging sour crudes or using sulfuric acid for acid treating or alkylation. Humble's particular operations originally included three basic sources of SO_2. These were acid-concentration operations, combustion of hydrogen sulfide in plant fuel gas, and combustion of acid sludges at boilerhouses. A minor source was the flue gas from catalytic cracker regenerators.

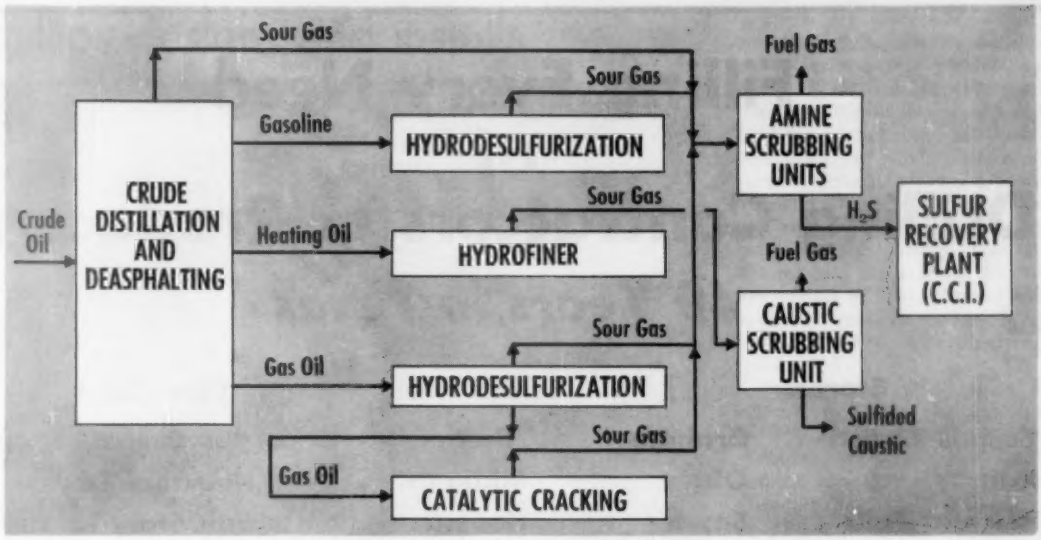
Sulfuric-acid flow at the time the SO_2 reduction program was begun is shown in Fig. 2. At that time, black 98% acid was used as the catalyst at the alkylation plant and it was also used for treating lube distillates, lube residuum, and aromatic solvents. Part of the spent alkylation acid was used to treat gasoline, heating oil and solvents.

Most of the spent acids from the many operations underwent hydrolysis and concentrations, and the acid was then shipped to another plant for fortification. Spent acids from lube residuums and aromatics treating could not be handled in this manner, and with the hydrocarbon phase from the hydrolysis step were burned at boilerhouses. With this set up, about 45% of the acid entering the plant was decomposed to SO_2 and released to the atmosphere.

Major changes were instituted to eliminate acid use wherever possible. The part Hydrofining, clay treating, and deresining facilities played in this has already been discussed.

Two operations still require sulfuric acid, alkylation, and lube residuum treating and it is expected that the latter use will be eliminated before long.

An acid-regeneration plant was installed and is operated by Consoli-



SOUR-GAS FLOW shows that H_2S produced in refining operations is now converted to sulfur. Formerly it went to plant fuel. Fig. 4.

dated Chemicals Industries, a division of Stauffer Chemical Co., on a fee basis. This plant regenerates all spent alkylation acid and furnishes 98% white acid.

This route results in a new debit of approximately $1,000 per day as compared to the hydrolysis and concentration route. This is somewhat offset by more efficient operations and a higher product quality resulting from the use of white acid, rather than refortified black acid. Revised acid flow is shown in Fig. 3.

Hydrogen Sulfide . . . Any H_2S discarded to refinery fuel gas is ultimately converted to SO_2, and this was a second principal source of contamination. Sour-gas flow within the refinery is shown in Fig. 4. The H_2S from crude distillation went to refinery gas until a sulfur-recovery plant was placed in operation in 1954.

This plant, constructed and operated by Consolidated Chemical Industries, removed about 60% of the H_2S being produced at the time. Hydrofining units and hydroesulfurization units were installed which would have resulted in a substantial amount of H_2S being released to the fuel gas system, had they not been equipped with amine scrubbers to remove the H_2S generated in the processes. This H_2S is also handled at the since-expanded sulfur-recovery plant.

An additional amine scrubber was added to recover the H_2S from the light hydrocarbons produced by catalytic cracking. With these facilities there is normally no H_2S entering the fuel-gas system. The minor discharge of SO_2 with the catalytic cracking regenerator flue gases has been curtailed by desulfurizing high-sulfur catalytic cracking feed stocks in one of the new hydrodesulfurizing units.

Progress made by Humble in reducing SO_2 emissions is shown in Table 1.

Flare . . . A special smokeless ground flare was installed as a replacement for a conventional flare at the propane lube plant. The system is designed to release an inventory of 5,000 bbl. of liquid propane from the unit in 1 hour in case of emergency. During this one-hour period, 750 bbl. of propane will be vaporized and burned in the smokeless flare. The remaining propane can be vaporized from a blowdown sphere and burned over a 7-hour period if desired.

Catalyst fines . . . The only dust problem encountered at the Baytown refinery is the discharge of catalyst to the atmosphere from fluid catalytic cracking units. With the two older units, expansion projects have included two additional stages of regenerator cyclones at each unit to insure that catalyst losses are as small as possible. A new catalytic cracker recently placed on stream has been designed to minimize catalyst losses.

TABLE 1—REDUCTION IN SO_2 RELEASE

Method of reduction	% reduction
Reduced acid usage:	
Hydrofining	2
Clay treating	12
Improved deasphalting	6
Subtotal	20
Acid-regeneration plant	13
Hydrodesulfurization, Girbitol scrubbing, and sulfur recovery	58
Residuum sludge hydrolysis	3
Total reduction by end of 1958	94

Hydrocarbon vapors . . . Minimizing the loss of hydrocarbon vapor to the air is not only an important part of the air contamination prevention program but it is also an important economic problem. A special group—the oil loss committee—constantly strives to eliminate hydrocarbon losses.

Some of the effective steps taken in this direction include installation of mechanical seals on a large number of pumps, extension of the existing vapor-recovery system to include all tanks handling light products, the use of chalking white paint on a large number of crude and gasoline tanks, and the installation of the covered preseparation flumes on the refinery trunk sewers.

Acknowledgments

Cooperation of the management of Humble Oil & Refining Co., in the release of this material and the assistance of Mr. E. Q. Camp, S. O. Brady, and H. A. Holcomb, in its compilation is gratefully acknowledged.

References

S. O. Brady et al, "Humble's Progress in Pollution Abatement," Sept. 1956 HO&R technical report.

John H. McClintock, "Evaluate Pollution Control This Way," Western Pet. Rfg. Assn., meeting, October 1958.

A. R. Dudley, "How Control Over SO_2 Emission Reduces Air Contamination," Chem. Engr. Progress, March 1957.

A. R. Dudley, A. M. Souby, "Control of SO_2 Discharge at Humble's Baytown Refinery," Am. Chem. So., San Antonio section meeting, December 1958.

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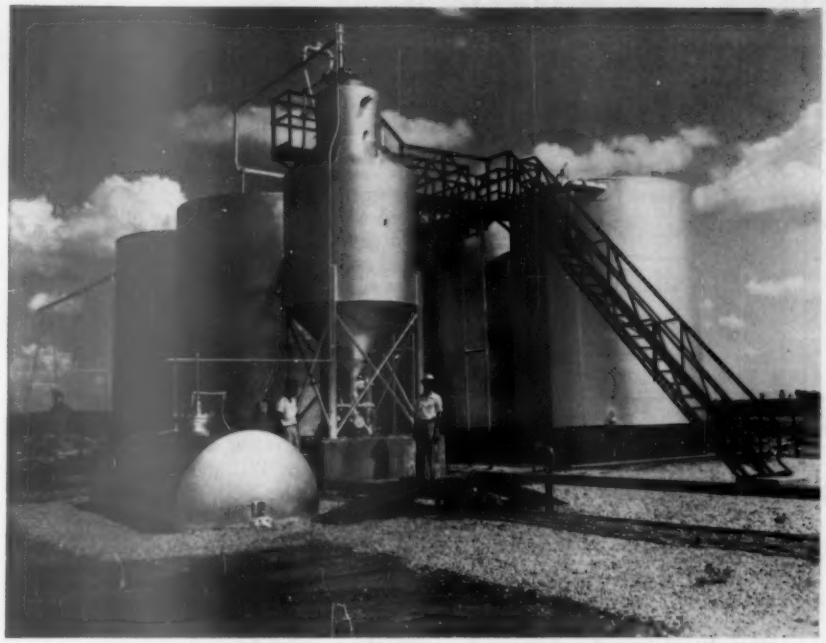


NORTH BURBANK Unit Battery No. 68 is controlled by new system.

New LACT instrumentation

Package-type equipment means . . .

- More accurate measurement of fluid properties.
- Initial cost only one-half that of off-the-shelf instruments.
- Fast payout through product savings and elimination of daily attention.
- Elimination of sampling and sample storage.

A NEW instrumentation package for LACT systems has been developed by Phillips Petroleum Co. which is **more accurate** than conventional methods and costs **$2,000 less than** off-the-shelf equipment not designed specifically for the job. The system has been tested for **14** months in Phillips' North Burbank unit and three new installations are being equipped with this "packaged system" which eliminates the need for sampling and puts manual attention on a once a month basis instead of once per day.

With this system, measurements of temperature, volume, b.s. and w., and gravity are made at the lease. Data are stored on readout counters to be used by the gager in writing

BY L. E. KUNTZ
Phillips Petroleum Co.

run tickets at any interval from 1 day to 1 month.

Why needed . . . While typical LACT systems (Figs. 1 and 2) have eliminated tank gaging in measuring the volume of transferred fluid, instruments and equipment for finding gravity, temperature, and b.s. and w. are not too far advanced. The sampler has replaced the tank thief but manual attention is still required to measure properties of the stored sample. The temperature recorder has replaced the thermometer but chart reading and averaging are still done manually.

There are hundreds of samplers commercially available, all designed to obtain the best possible sample. But it is difficult to obtain a composite crude-oil sample, store it in the field for several days, and then make centrifuge and gravity tests which accurately reflect its original properties. To eliminate the sampler, instruments are needed which will measure and read out the average b.s. and w. content and the average gravity over any period of time. Manual attention would be required only for periodic checking and to write a monthly run ticket.

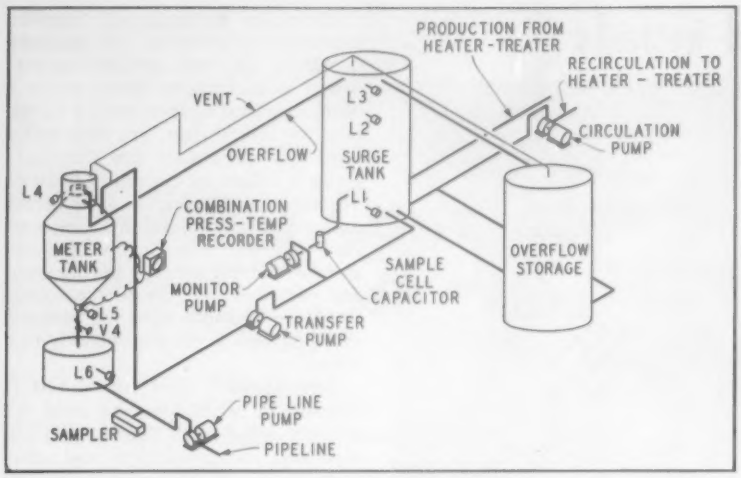
Figs. 1 and 2 show typical LACT systems in which the b.s. and w. monitor serves only "police duty"—watching the production and controlling the system in a go-no go fashion to prevent transfer of bad oil. In such a system accuracy and stability requirements are not so strict. But having an instrument which meets more critical specifications makes it possible to not only police the system but also to obtain the average b.s. and w. content for run-ticket purposes.

Why monitors work . . . Most b.s. and w. monitors are capacitance-measuring instruments—they detect the change in crude-oil dielectric constant, K, caused by the presence of water or water-coated b.s.

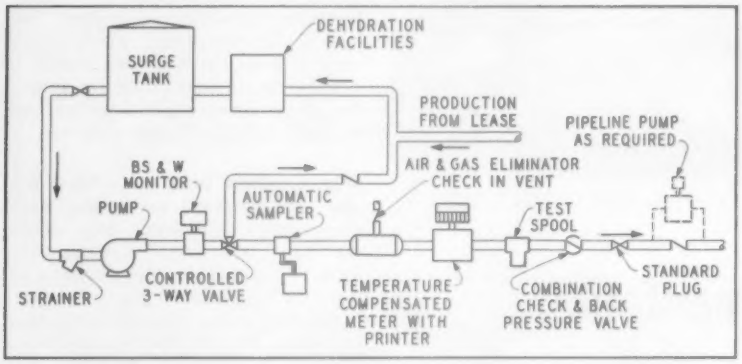
For dry crude, $K = 2$ to 2.3, but for water, $K = 80$. For a water-in-oil emulsion K increases about 3% for each volume per cent of water. This relationship is nearly linear up to 50% water. From these relationships it can be seen that an accurate, stable capacitance-measuring device is a good indicator of b.s. and w. content.

An oil-patch instrument . . . A b.s. and w.-measuring instrument which can replace the sampler for run-ticket purposes should meet the following requirements.

1. Calibrated 0-2% full scale.
2. Indicator calibrated in tenths of a per cent b.s. and w.
3. Adjustable set point to provide contact closures for controlling the LACT system when bad oil is detected.
4. Fail safe so no oil can be transferred when the instrument has failed.
5. Accuracy of $\pm 0.05\%$ b.s. and w.
6. Stability of $\pm 0.02\%$ b.s. and w. even when line voltage varies $\pm$ 15% and ambient temperature varies from -20° to $+120^\circ$ F.
7. Temperature compensation. Dielectric constant of crude oil decreases approximately 0.8% for each 10° F. temperature rise—this change must not affect the instrument reading.



TYPICAL fixed volume LACT system. Fig. 1.



TYPICAL positive-displacement meter LACT system. Fig. 2.

8. Insensitive to conductivity changes in the fluid being analyzed.

9. Easily checked and maintained in the field.

What about maintenance? . . . Electronic technicians are scarce in the oil field, so it is important that the monitoring instrument have built-in self-checking means. When a pumper or lease foreman is called out because of bad oil, he wants assurance that the monitor isn't lying. In case of a monitor failure, nontechnical personnel should be able to service the instrument, check and calibrate it with no more than a standard volt-ohm meter. The special instructions required for trouble shooting and preventive maintenance should take only a few hours at the time of installation.

Various b.s. and w. monitors have been used, but one developed by Phillips and manufactured by United Engineers, Tulsa, has met the above requirements most successfully. Fig. 3 illustrates in block form the capacitance-measuring circuit and temperature compensation used in this instrument.

Sample cell important . . . The sample cell capacitor is a chamber where the change in dielectric constant of the fluid is sensed by the capacitance-measuring instrument. The sample cell is usually a length of pipe with a "probe" inside that is mounted on electrical insulation having a very stable dielectric constant.

The capacitance cell must be carefully constructed and properly designed for use in particular crude oils. Buildup of sludge on the cell elements will cause the capacitance to increase and the monitor meter will drift upscale. This effect can be minimized by using the optimum relative diameters of the pipe and probe and by plastic coating the active surfaces within the cell. Where sludge is a problem it is important to keep the fluid warm and provide a high fluid velocity through the cell. With the piping arrangement shown in Fig. 4 the cell receives the total discharge from the transfer pump which tends to flush out any sludge that has accumulated while only the monitor-pump bypass stream was being sampled.

Automatic averaging of b.s. and w. . . . Fig. 4 shows a piping arrangement which allows the monitor to sample continuously a sidestream from the surge tank and also sample the total transferred stream when the meter tank is being filled. It is obvious that a similar arrangement can be used in a positive-displacement meter system.

The integral of monitor reading with respect to flow through the sample cell while the meter tank is filling would give the volume of b.s. and w. transferred. However, since the transfer rate is essentially constant, the monitor reading integrated with respect to time will give the per cent volume of b.s. and w. transferred. A summation of instantaneous monitor readings over a period of time from T_1 to T_2 divided by time $T_2 - T_1$, in the appropriate units will give the average per cent b.s. and w. transferred during the period regardless of the absolute flow rate so long as it is constant.

Voltage to pulse-rate transducer . . . An integrator has been developed by Computers, Inc., Houston, which receives the monitor d.c. voltage output and converts it to a pulse rate in the following manner:

The d.c. voltage from the monitor is applied to a saturable core reactor through a transistorized switching circuit. Direct current in the winding causes core saturation in the positive direction at which instant the polarity

THE AUTHOR

L. E. Kuntz has lived with LACT instrumentation and design problems from the first Phillips dual meter tank system through 25 subsequent installations and their evolution into the simple, reliable single tank standard units being installed at the present time. Since 1956 he has been particularly concerned with development of capacitance-type b.s. and w. monitor control systems and other special instruments and equipment for LACT. He has been with Phillips' research and development department since 1954, and holds the title of control systems engineer.

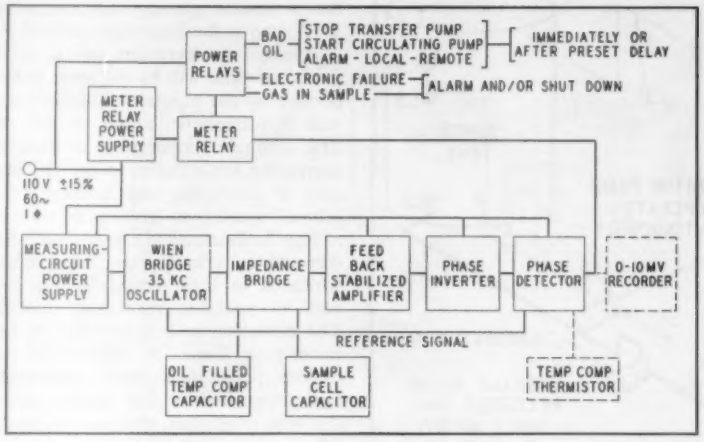


Fig. 3.

Capacitance measuring circuit. A fixed frequency (35 KC), Wien bridge oscillator drives a precision impedance bridge. One arm of the impedance bridge includes the sample cell capacitor. The bridge configuration is such that unbalance signals resulting from resistance or capacitance are approximately 90° out of phase with respect to each other. The unbalance signal is amplified and shifted in phase so that capacitance signals arrive in phase or 180° out of phase with a reference signal derived from the driving oscillator. The resistive signal is thus about 90° out of phase with the reference signal. The phase detector, being relatively insensitive to the resistive signal, does not detect changes in the leakage characteristics of the sample cell and its fluid and produces no output signal. The resultant output signal is proportional only to the magnitude and direction of the dielectric constant change in the liquid stream.

The output of the phase detector is monitored by a meter relay which has adjustable upper and lower limit contacts and associated power circuitry to perform the control functions.

Temperature compensation. Compensation for the temperature coefficient of dielectric constant is accomplished by the oil-filled temperature compensation capacitor. This reference cell has the same active capacity as the sample cell and is filled with dry crude representative of that to be transferred. It is connected to the impedance bridge electrically opposite the sample cell and is mounted physically in the flowing stream so that temperatures are equal. Variations in fluid dielectric constant, caused by temperature, will cause equal impedance changes and no unbalance signal will result.

An alternate method of temperature compensation, shown by dashed lines, uses a probe-mounted thermistor immersed in the sample stream and connected electrically to the phase detector (Fig. 3).

of the coil input is reversed by action of the transistors. The core is then driven to negative saturation and the switching again occurs. The saturation and switching rate are directly proportional to the magnitude of the d.c. voltage from the b.s. and w. monitor. Each switching operation pulses the integrator output relay.

The pulse-rate variation is linear from 0 to 100 pulses per minute corresponding to the monitor output for 0 to 1% b.s. and w. While the transfer pump is running, the b.s. and w. pulses are accumulated on an electrical impulse counter, and time is registered in hundredths of minutes. At any instant the average per cent b.s. and w. transferred since the registers were set to zero is the quotient of the b.s. and w. register divided by the time register.

Increased accuracy . . . The important features of this automatic system are the increased accuracy of analyzing the stream, the elimination of sample storage, and elimination of human errors in sample and data handling. The over-all accuracy of the monitor and averager is plus or minus 0.05% b.s. and w. A centrifuged composite sample cannot be read with such accuracy. In the manual method any small error in obtaining the crude sample from the transfer line and from the sample storage container is magnified in direct proportion to the volume of oil transferred. In most instances the 50-cc. sample represents at least 500 bbl. of oil and in some cases as much as 10,000 bbl. When the monitor is used, every drop of fluid is analyzed for b.s. and w. content during the exact time of transfer—there is no drawoff of a sidestream or intermediate storage for later analysis.

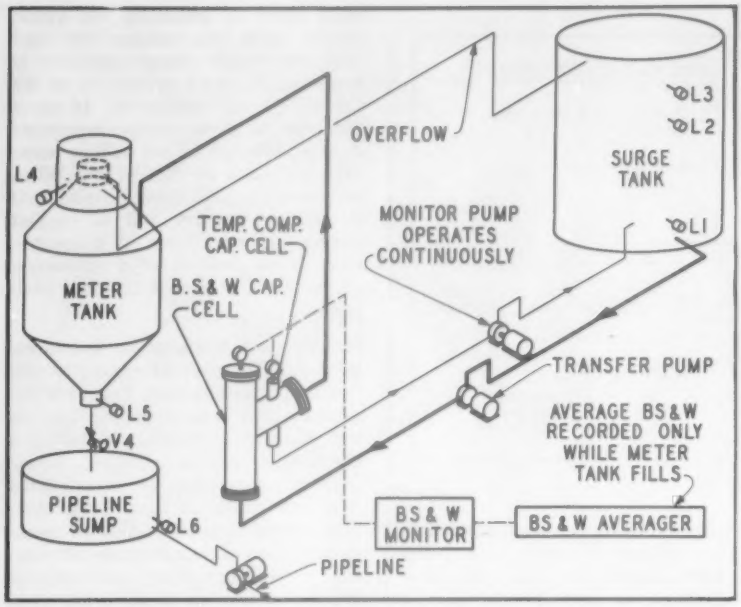
Gravity and temperature considerations . . . The monitor—full flow cell—averager combination has made the sampler and centrifuge obsolete for b.s. and w. accounting by giving a continuous stream analysis whose average value can be accumulated over any period of time. Most operators would replace the daily or weekly run ticket with a monthly accounting if the complete data—average gravity, average temperature, and average b.s. and w.—were accurately accumulated and stored over that period.

In gravity measurement, as well as in b.s. and w. measurement, there is a payout for instrumentation in labor savings. The procedures involved in storing a composite sample and obtaining an API gravity reading from a conventional hydrometer inevitably cause some loss of light ends resulting in a lowered gravity reading. If this occurred at the price break, it would reduce the payment per barrel for the entire run. Gravity measurement for accounting purposes should be made in the meter tank, at existing tank pressure and temperature just prior to release to pipeline.

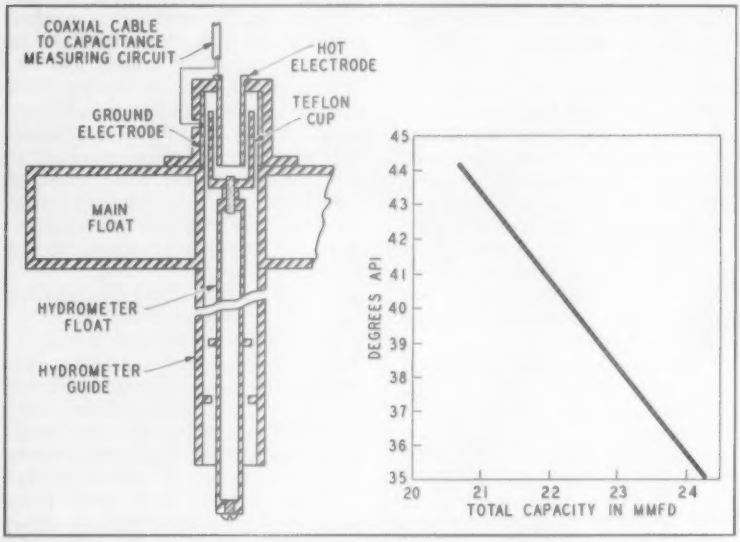
Temperature measurement and recording has not been a problem, particularly in positive-displacement meter systems where temperature compensation is built into the meter head. However, in dump-tank systems where large volumes of oil are transferred through relatively small meter tanks there is considerable manual effort (with the attendant possibility for error) required to average the analog charts for a day's run. Where small meter tanks are filled at high rates, response time of the liquid-filled thermal system is too great and electronic temperature measurement is required.

Time sharing reduces cost . . . In looking for instruments particularly for LACT, with quality as well as economy in mind, gravity and temperature-sensing devices were developed which could be time shared with the integrator and/or b.s. and w. monitor by means of a programer.

When the meter tank is filled to weir level the integration of b.s. and



THIS PIPING ARRANGEMENT allows the monitor to continuously sample a side-stream from the surge tank and also sample the total transferred stream when the meter tank is being filled. Fig. 4.



TRANSDUCER for converting gravity to capacitance. The complete unit is installed in the meter tank dome. Fig. 5.

w. is completed. Instead of sitting idle, the integrator is then used to convert the oil temperature to a pulse rate.

The temperature-sensing unit, built by Computers, Inc., consists of a power supply, magnetic amplifier, and scale-factor unit. It uses a platinum-wire resistance bulb housed in a stainless-steel tube to sense the temperature change in the meter tank. Two adjustable dials provide for zero and span settings. There are no vacuum tubes in the system and the output is normally zero to 1 ma. into 1,500 ohms—linear with temperature. A panel-mounted meter continuously indicates temperature.

Temperature readout cycle . . . The temperature transducer output is automatically applied to the integrator when the meter tank is filled to the weir level. The integrator output is zero to 100 pulses per minute directly proportional to 20° to 120° F. The pulses are accumulated for exactly 1 minute by means of a "gating" timer. Each pulse accumulated during the 1 minute gating time represents 1° F. above the base value of 20° F.

Average temperature for a given period of time will be the total pulses divided by the number of tank dumps and this quotient added to 20° F. The average temperature is used in correcting the volume to 60° F. and also in correcting the average "observed" gravity to gravity at 60° F.

Fig. 5 illustrates the transducer for converting gravity to capacitance which is in turn sensed by the b.s. and w. monitor measuring circuit. The complete unit is installed in the meter-tank dome. A sheet-metal enclosure protects it from condensate and supports it a few inches below the weir level when the tank is empty. When the tank fills, the capacitor unit is supported by the main float which floats freely on the oil surface. The hydrometer float is independent of the main float and is designed so that a 10°-gravity change will cause it to move up and down approximately 2 in. with respect to the main float. The Teflon cup attached to the upper end of the hydrometer float moves in and out between the stainless-steel concentric cylinders comprising the capacitor. The change in capacitance caused by movement of the Teflon cup between cylinders is measured by the capacitance instrument used for b.s. and w.

The capacitor, Teflon cup, and hydrometer float are designed so that the capacitance change caused by the hydrometer movement will be measurable by the b.s. and w. monitor and will cause an on-scale meter reading. Fig. 5B shows the linear relationship between oil gravity and capacitance change for a typical transducer.

Gravity readout cycle . . . When the 1-minute temperature readout is completed the gravity cell is automatically substituted for the b.s. and w. cell and the monitor output is connected to the integrator. The monitor reading is then a function of API gravity and the integrator pulse rate is zero to 100 per minute inversely proportional to gravity over a 10° API range—35° to 45° API for example.

The integrator pulses are passed through the 1-minute gating timer and accumulated on a register. Each pulse registered during this minute is equivalent to 0.1° API below the base value of 45°. Subtracting from 45 the quotient of total pulses divided by total tank dumps will give the average API gravity per dump up to that time.

Programer runs the show . . . Fig. 6 illustrates the data readout system.

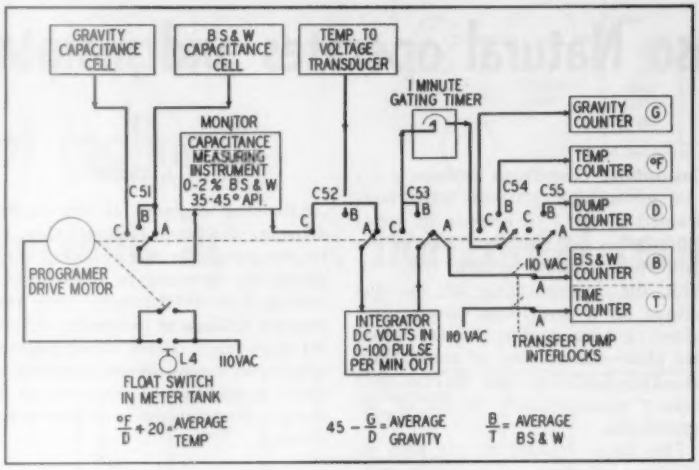


Fig. 6.

The programer drive motor is energized each time the meter tank fills. It drives cams which actuate switches CS1, 2, 3, 4, 5 as shown schematically by the five gang-operated, three-position switches in the figure.

While the meter tank is filling, all switches are in position A as shown. The b.s. and w. capacitance cell is connected to the monitor input through CS1. The monitor output is connected to the integrator through CS2. The integrator output is connected to the b.s. and w. counter through CS3 and one of the transfer-pump interlock contacts. The time counter is energized through the other transfer-pump interlock contact. Monitoring and integration of b.s. and w. continues until the meter tank is full and float switch L4 (see Fig. 4) in the meter tank closes.

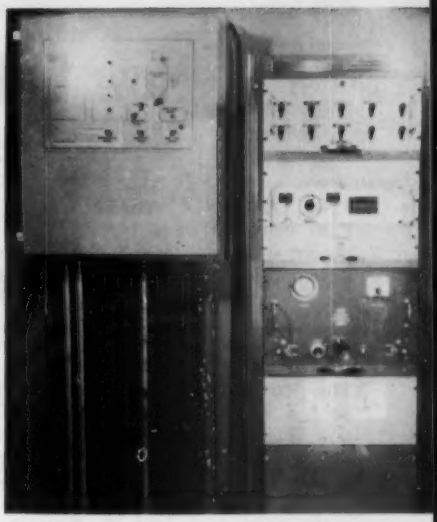
The transfer pump stops, the transfer pump interlock contacts open, and the programer drive motor starts. The cam switches move from position A to position B. The monitor remains connected through CS1 to the b.s. and w. capacitance cell. The temperature transducer is switched by CS2 to the integrator input. The integrator output is switched by CS3 to the gating timer. Pulses from the integrator coming through the gating timer are fed to the temperature counter through CS4. The dump counter is connected through CS5 to a voltage source so that one dump is registered. At the end of 1 minute the gating timer resets—interrupting the pulses to the temperature counter. The temperature readout is completed.

The cam switches move from position B to position C. The gravity capacitance cell is connected to the monitor input through CS1. The monitor output is connected to the integrator through CS2. The integrator output remains connected to the gating timer through CS3. Pulses from the integrator coming through the gating timer are fed to the gravity counter through CS4. At the end of 1 minute the gating timer resets—interrupting the pulses to the gravity counter. The gravity readout is completed.

The cam switches move to position A and the cam drive motor stops. The b.s. and w. cell is connected to the monitor input through CS1. The monitor samples a bypass stream from the surge tank but no integrating is done until the transfer pump restarts—the cycle repeats. Readings on the various registers represented by the letters (G) (°F.) (D) (B) (T) are used in equations as shown at the bottom of the figure to arrive at run-ticket values (Fig. 6).

The programer controls the readout sequence in step with the filling and dumping of the meter tank. It also switches transducers into various combinations for time sharing.

Can be used with p.d. meter . . . In a p.d.-meter system, the b.s. and w. monitor, capacitance cell, the averager would be applied much the same as in the dump-tank system. The gravity and temperature measurements would be made in the surge tank at the time the "normal-high" level was reached. The average observed gravity would be converted to gravity at 60° F. when the run ticket is made.



LACT control cabinet is at the left. In the panel rack, from top to bottom, are the signal system transmitter, data readout programer, b.s. and w. monitor, and combination integrator and temperature transducer. Fig. 7.

Conclusions

This readout of average values is not the ultimate—there will be many improvements—but for the present they offer considerable payout per investment dollar. Instrumentation of the type required in LACT is relatively new to the oil-producing and oil-gathering industries. Managers have been alarmed by the high cost of even the minimum instrumentation compared to the total cost of a LACT unit—and they should be. This equipment has served only police duty while conventional methods of gravity and b.s. and w. measurement have been manually applied to accounting.

There are individual instruments commercially available which will make the measurements and readout the data required for LACT. However, these off-the-shelf items cost nearly twice as much as the integrated package of devices designed especially for the job. It is interesting to note that this integrated instrumentation package costs only about $1,500 more than the sampler, b.s. and w. monitor, temperature and pressure recorder presently considered adequate for police duty in LACT. This difference would be paid out within a very short time by savings in labor—through 30-day unattended operation and by product savings—through elimination of sample storage and the losses associated with manual techniques of determining b.s. and w. and API gravity.

How El Paso Natural operates and maintains

BY M. J. CROWLEY

. . . division engineer of the southern division, El Paso Natural Gas Co., for the past year and a half. Crowley joined the company in 1949 after receiving a BS in chemistry from Texas Western College of University of Texas. His experience covers water treatment and water control of the main-line stations, in addition to maintenance and design of compressor and pipeline facilities.

THE COOLING SYSTEMS of El Paso Natural's three types of compressor stations differ enough to create different problems and necessitate the use of procedures which are peculiar to each particular type plant.

Horizontal reciprocating stations . . . The first station to be discussed will be the horizontal reciprocating station (Fig. 1). As can be seen from the schematic, this type of cooling system incorporates the use of the atmospheric tower and utilizes the circulation of water directly from the tower basin. The gas cooling is done in a shell-and-tube system.

The water when discharged from the gas-cooling system in turn goes to the engine-cooling system and is returned over the tower. In two of these stations we have redesigned this system so as to achieve finer control. Basically, this is a piping change to blend hot and cold water.

Vertical reciprocating stations . . . The second system to be discussed is the vertical reciprocating station (Fig. 2). These stations, built in our expansion to deliver gas to the California markets, were put in operation in the early part of 1949. The cooling system is basically broken down to three units:

1. Engine-jacket-water system.
2. Engine-oil-cooling system.
3. Pipeline-gas cooling.

The engine-jacket-water system is a totally enclosed circulation system, the heat-removal unit being an atmospheric fin-fan unit. The oil-cooling water is again a totally enclosed circulation system with the heat-exchange unit of the oil being a shell-and-tube engine-mounted unit. The cooling water is then circulated through a bent-tube section in the induced-draft cooling tower.

The pipeline-gas cooling is accomplished by circulating the discharge gas through bent-tube sections in the same induced-draft cooling tower as mentioned before. The application of the atmospheric fin-fan sections is dependent on the ambient conditions existing at the station site. However, in some cases these have been eliminated and all heat exchangers were placed in the cooling tower.

Presented at ASME Petroleum Mechanical Engineering Conference, Houston, September 21-23.

Gas-turbine centrifugal stations . . . Ten gas-turbine stations were constructed in 1952 to operate in series with the reciprocating stations in the California pipeline system (Fig. 3). With the incorporating of the gas turbine as a centrifugal-compressor driver, a new cooling feature came into play—the cooling of combustion air. The 5,000-hp. gas turbine will require approximately 90 lb. of air per second.

This large amount of air with its problems of dust, wind-blown particles, and humidity necessitated the use of a unit both to cool and wash the air. The obvious problems which have occurred will be discussed later. In general, the system of the turbine station is a very simple type of design. Treated water is basically separated into two systems:

1. The air washer, which operates very similarly to an evaporative air conditioner.

2. The closed heat-exchange system which is again broken down into three systems:

(a) The oil-cooling system where the turbine oil is cooled with the use of shell-and-tube heat exchanger.

(b) The same source of cooling water is used in parallel to cool the jacket water for the auxiliary generating unit which has been installed in some of our plants.

(c) In the combustion system of the split-shaft, two-stage gas turbine there is installed a set of variable nozzles to control the speed of the load turbine. These nozzles are cooled by the circulation of distilled water through a port system. This distilled water in turn is cooled by the cooling-water system in a shell-and-tube heat exchanger. The water, upon leaving the cooling jackets and shell-and-tube exchangers, as mentioned in the second system described above, is then cooled by the use of an atmospheric fin-fan unit.

Water-treatment problems . . . Due to the geographical location of our company, water is a precious item. Our water supply source is usually from deep wells. The average depth of our wells is in the neighborhood of 500 ft. The water in general in southern division—which incorporates southern Arizona, southern New Mexico, and three counties of West Texas—is of poor quality.

In all but one case of the 23 stations in the division, softening equipment is incorporated in our water-supply system. Zeolite treatment is used in 21 cases and in one location, 50 miles west of Phoenix, cold lime-soda treatment is used. With all plant water being softened, additives are used to control corrosion and combat scale.

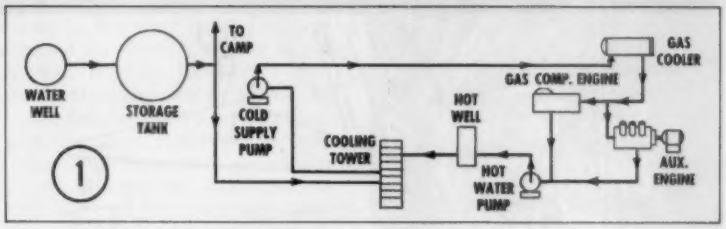
In our vertical reciprocating systems, the internal treatment is by the use of phosphate sodium chromate mixture. Basically, the internal system of the other two types of stations is the same. The cooling-tower control on these stations is treated by metaphosphate compounds. The climatic conditions in the Southwest create an atmosphere in our cooling towers which encourages the prolific propogation of algae. The control of this algae is accomplished by the use of chlorine gas with intermittent shock treatments of phenol compounds.

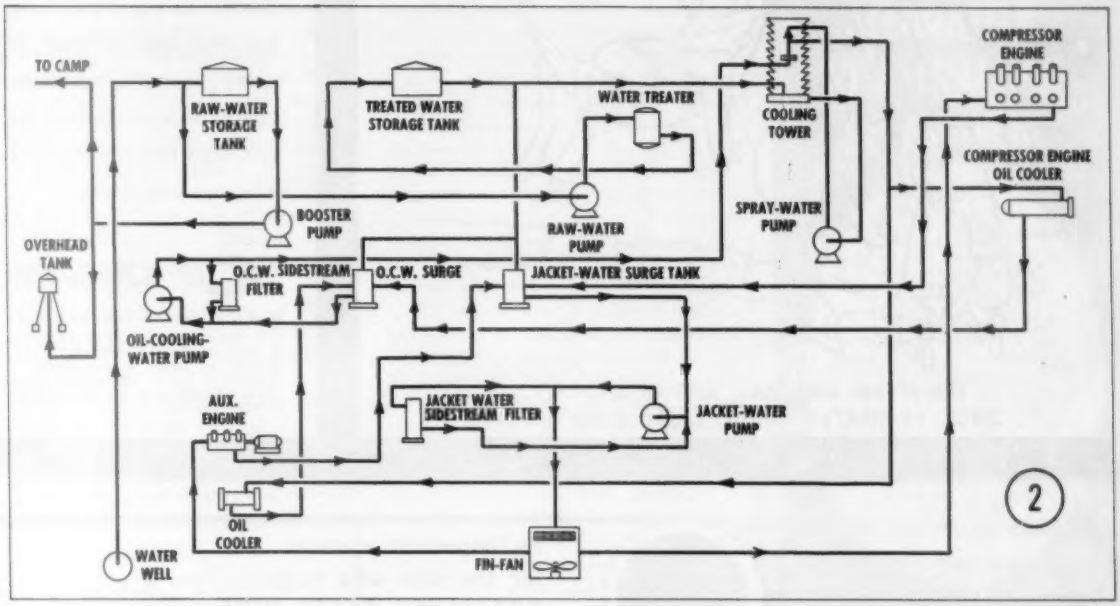
The air-washer system of the turbine station, however, has its own peculiarities, and has to be treated by a different method. Until recently it was not deemed advisable to use chromate treatment in this water, and the only method of control was by the use of plastic coating.

The turbine manufacturers suggested that we not use sodium compounds such as sodium dichromate, because of the corrosion activity of sodium salts on high-temperature turbine buckets. We decided recently to include in the treatment of the water sodium chromate due to the progressive corrosion activity caused by certain water upon softening. We feel that the carryover of sodium salts into combustion systems would be negligible.

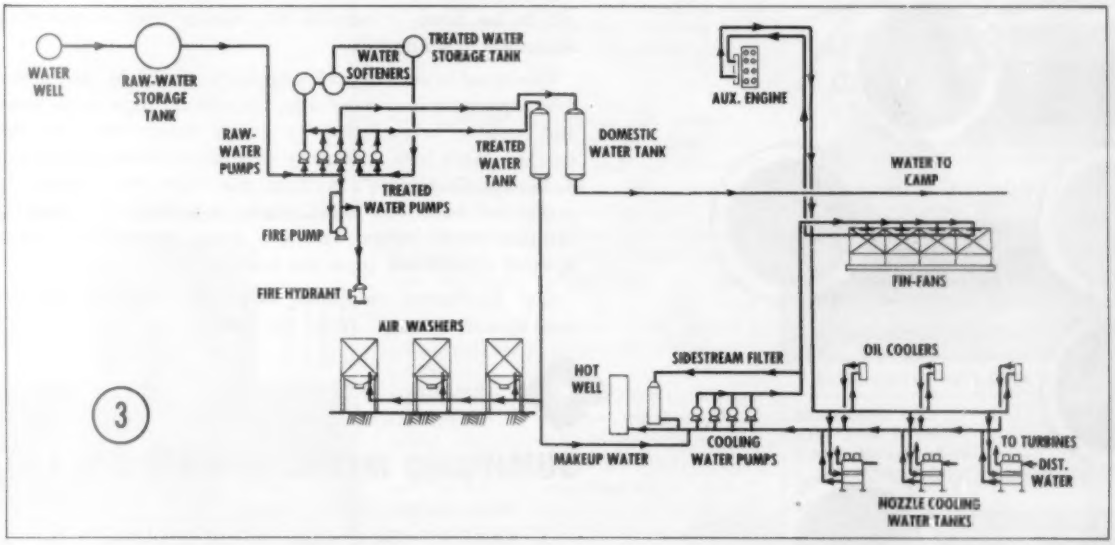
With the before-mentioned water-

three types of cooling systems at . . . horizontal reciprocating





. . . vertical reciprocating



. . . and gas-turbine centrifugal stations

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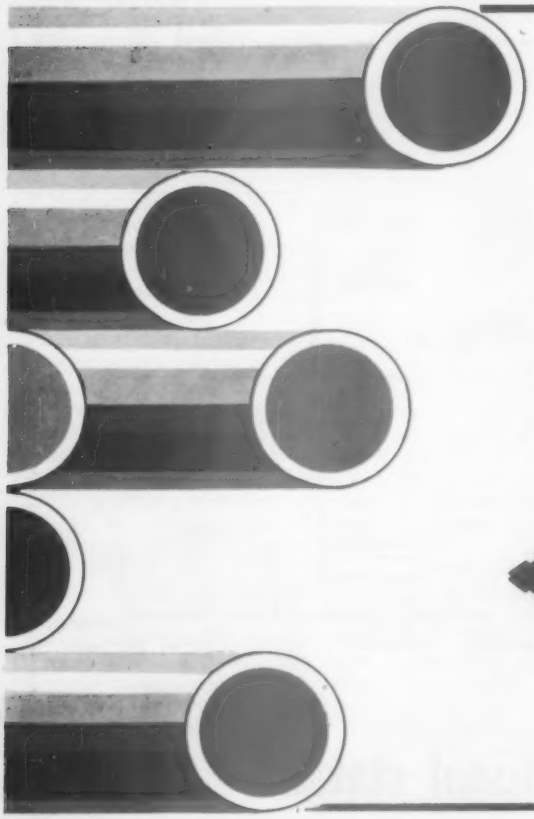

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treatment methods used, we feel that the major problem of our cooling system has been eliminated. However, there are three problems which have offered some concern.

Delignification and corrosion . . . Two problems immediately come to mind on the cooling towers of our division. The major problem which has always been a factor in the operation of wooden structures is delignification. This has been discussed by many of the water-treating people of the United States, and the point to which they always return is the control of alkalinity of the cooling water by the use of acid. We have not yet found a satisfactory feeding and control mechanism within a reasonable price.

The second problem, which has arisen in our induced-draft towers, is the stress corrosion of admiralty metal tubes. This type of corrosion is induced by two chemical compounds quite familiar to the gas industry—ammonia and mercury. However, it was hard to find a source of either one of these compounds in our cooling towers. At the time that this corrosion took place in a particular tower we were attempting to feed acid for scale control.

After much study, we learned that under low-alkaline conditions ammonia was liberated upon the addition of tertiary ammonia algae-control compound. We were using this type compound for shock treatment at the time. The reaction took place and, in turn, ammonia was absorbed by the scale existing on the tube bundles. The problem was eliminated by halting the use of ammonia compounds for algae control. We have also replaced many of the admiralty tubes in this tower with cupro-nickel metal.

Fin-fan and air washer . . . The problems which have occurred in the atmospheric fin-fan sections have been mostly mechanical. The gear box in all instances was the source of the trouble. More specifically, due to the design of the particular gear boxes in use, complete lubrication was not being accomplished by the use of the lubricant suggested by the manufacturer. However, the petroleum companies supplying other lubricants within the plant made suggestions and controlled this problem by the use of additives.

The air washer mentioned before brought to us a new set of problems. The first was the liquid carryover out of these units into the axial-flow air compressors of the turbines. Minor changes in the operation of the water-distribution system and a minor change in the internal drain system eliminated most of this trouble.

Filter material such as glass fiber, monel metal wool, and aspen-wood shavings was used with varying success. These pads, due to the operation in which they are used, create a problem of cleaning. A good deal of damage is done to these pads in the cleaning operation. I believe that work can be done in producing a low-cost filter media for cleaning of this type, and for evaporation control.

New installation plans . . . In connection with the cooling operations of our division, in the near future we are planning to install new cooling equipment on the scavenging-air system on some of the two-cycle engines. Detonation is always a problem with high ambient temperatures in the southwestern part of the United States. It will be some time before the installation is completely evaluated.

With the pipeline systems being constructed in different parts of the world, and especially in the arid areas of the world, there is a definite need and future for waste-heat-type cooling systems. With this in mind, I feel that industry today is fast changing its mind—it is applying heat to its use rather than removing heat for comfort.

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BY W. L. NELSON
Technical Editor and Petroleum Consultant

Approximate price indexes of refinery chemicals

(Based on 1956)

ALTHOUGH the prices of industrial chemicals have not ranged widely, the kinds of chemicals used in petroleum refining have changed constantly to more and more expensive varieties. Until 1932, the main refinery chemicals were sulfuric acid, caustic soda, soda ash, litharge, fuller's earth, and sulfur (although considerable copper oxide was used prior to 1920).

Inhibitors for gasoline began to be used in 1930, and tetraethyl lead began to be significant in 1932. Solvents were used in the refining of lubricating oils after 1938 and lubricating-oil additives became important after 1941. Cracking catalysts, tetraethyl lead, and additives all acted during World War II to increase the price of the chemicals used in refining.

Extremely expensive reforming catalysts were employed after 1950 and gasoline additives became significant after 1953. These effects are indicated in the final column, Refinery Chemicals (others), which shows that each pound of chemical used (excluding TEL) in refining in 1930 cost less than 1 cent whereas in 1956 the cost was about 4.9 cents.

Additive Agents

Additive agents (excluding TEL) during 1956 cost the industry over 160 million dollars at a cost of about 22 cents per pound, whereas the cost of such additives was insignificant in 1938. The Refining Chemicals (others) Index was obtained by an examination of the kinds and amounts of chemicals used throughout the years.

The other indexes are based during the latest years on Bureau of Labor Statistics "Wholesale Prices." These are carried on the quarterly Itemized Cost Indexes page of The Oil and Gas Journal (January, April, July, and October). The Average Chemicals Indexes (first three columns) are useful only in judging the price changes of large volume chemicals similar to those shown in the table. They do not apply directly to the cost of average refinery chemicals. Unfortunately, there is no simple way to gage changes in the average cost of refinery chemicals.

	Average chemicals												Refinery chemicals	
	Industrial	Inorganic	Organic	Sulfuric acid	Phosphoric acid	Sodium carbonate	Sodium hydroxide	Sodium phosphate	Lime	Ammonia anhydrous	Furfural	MEK	Phenol	TEL† fluid	Others*
Code§	6-1	6-11	6-12	6-11-09	6-11-07	6-11-65	6-11-69	6-11-71	6-11-29	6-11-13	6-12-63	....	6-12-83	....	....
1921	....	....	....	81.5	....	....	....	....	....	....	....	....	....	....	....
1926	69.6	....	....	....	....	....	....	....	....	....	....	....	....	459.0	....
1928	68.6	....	....	....	....	....	....	....	....	....	....	....	....	451.0	....
1930	65.6	....	....	....	....	....	....	....	....	....	....	....	....	300.0	18.7
1931	62.7	....	....	....	....	90.7	60.8	....	....	....	....	....	....	280.0	20.4
1932	61.8	....	....	....	....	....	....	....	....	....	....	....	....	253.0	23.0
1933	60.3	....	....	....	....	....	66.5	....	....	....	....	....	....	229.0	17.3
1934	60.3	....	....	69.2	80.0	67.0	61.5	47.8	64.6	97.0	83.3	....	87.3	150.0	17.6
1935	61.6	....	....	69.2	80.0	69.3	62.6	53.5	64.6	97.0	83.3	....	87.3	136.0	15.1
1936	61.2	....	....	69.2	80.0	67.0	61.5	50.1	64.6	97.0	83.3	....	87.3	124.0	14.3
1937	61.3	....	....	73.8	80.0	65.1	59.6	50.1	64.6	97.0	83.3	....	87.3	119.0	16.1
1938	60.1	....	....	73.8	80.0	67.0	61.5	42.1	64.6	97.0	83.3	....	87.3	119.0	21.0
1939	58.9	....	....	73.8	66.7	59.0	54.4	47.8	64.6	97.0	75.0	....	87.3	117.0	20.6
1940	59.2	....	....	73.8	66.7	59.0	54.4	51.2	64.6	97.0	75.0	....	78.3	108.5	21.9
1941	60.6	....	....	73.8	66.7	59.0	54.4	53.5	64.6	97.0	75.0	....	75.3	95.4	23.3
1942	67.0	....	....	73.8	66.7	59.0	54.4	61.5	64.6	97.0	75.0	....	77.1	84.8	29.0
1943	67.1	....	....	73.8	66.7	59.0	54.4	61.5	64.6	97.0	75.0	....	63.3	82.5	31.3
1944	66.9	....	....	73.8	66.7	59.0	54.4	61.5	....	97.0	79.0	....	63.3	82.5	32.0
1945	66.9	....	....	73.8	66.7	59.0	54.4	61.5	....	89.4	79.0	....	63.3	82.5	33.2
1946	69.5	....	....	73.8	66.7	60.6	56.3	61.5	....	89.4	79.0	....	63.3	82.5	36.8
1947	82.1	....	....	73.6	73.3	69.0	62.7	78.6	....	96.2	79.0	....	67.5	82.5	45.2
1948	86.3	73.7	87.5	69.5	86.7	76.0	71.0	78.7	....	98.5	79.0	77.8	78.3	88.6	52.4
1949	79.2	....	....	76.1	86.7	76.7	73.5	85.3	....	104.8	79.0	85.2	81.3	95.9	50.0
1950	83.3	....	....	80.8	86.7	75.5	76.3	87.5	64.6	104.8	79.0	80.0	81.3	94.1	50.0
1951	89.3	....	....	89.5	93.3	84.5	80.6	94.1	64.6	104.9	79.0	102.2	110.6	105.4	56.1
1952	95.0	88.0	99.0	89.5	93.9	84.5	80.6	92.0	87.7	94.6	93.6	94.5	110.6	105.4	63.6
1953	96.9	92.2	100.0	95.5	95.7	90.1	84.8	94.2	89.2	98.9	98.5	94.5	106.3	105.4	70.5
1954	96.9	96.0	97.3	100.0	96.6	92.9	90.9	95.5	92.0	103.0	100.0	94.5	90.4	102.8	81.2
1955	97.4	97.2	97.3	100.0	97.5	94.3	94.3	95.5	93.5	103.0	100.0	94.5	92.9	98.6	88.5
1956	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1957	101.9	101.8	102.6	100.0	100.9	104.3	103.6	101.1	106.4	98.3	100.0	105.2	103.2	101.5	105.7
1958	101.8	103.1	101.1	100.0	103.4	104.3	112.6	104.6	104.4	103.6	100.0	106.9	102.7	99.9	106.7
July Unit Price Cents per pound,															
1959	102.1	104.0	101.2	100.0	103.4	104.3	115.7	104.6	106.8	106.5	100.0	103.3	95.2	100.6	103.1
1956	....	....	....	1.12	5.4	1.49	2.60	7.8	0.632	4.25	12.0	14.5	15.5	0.218cc‡	4.9

*Approximate. Reflects kinds of chemicals as well as their price. †Ethyl Corp. (also see Edgar, G., Tetraethyl lead, Prog. in Pet. Tech., p. 221, N. Y. Meeting of ACS, Sept. 1951). ‡274.9cc fluid contains 1 lb. TEL (60 cents per lb.). §Bureau of Labor Statistics.

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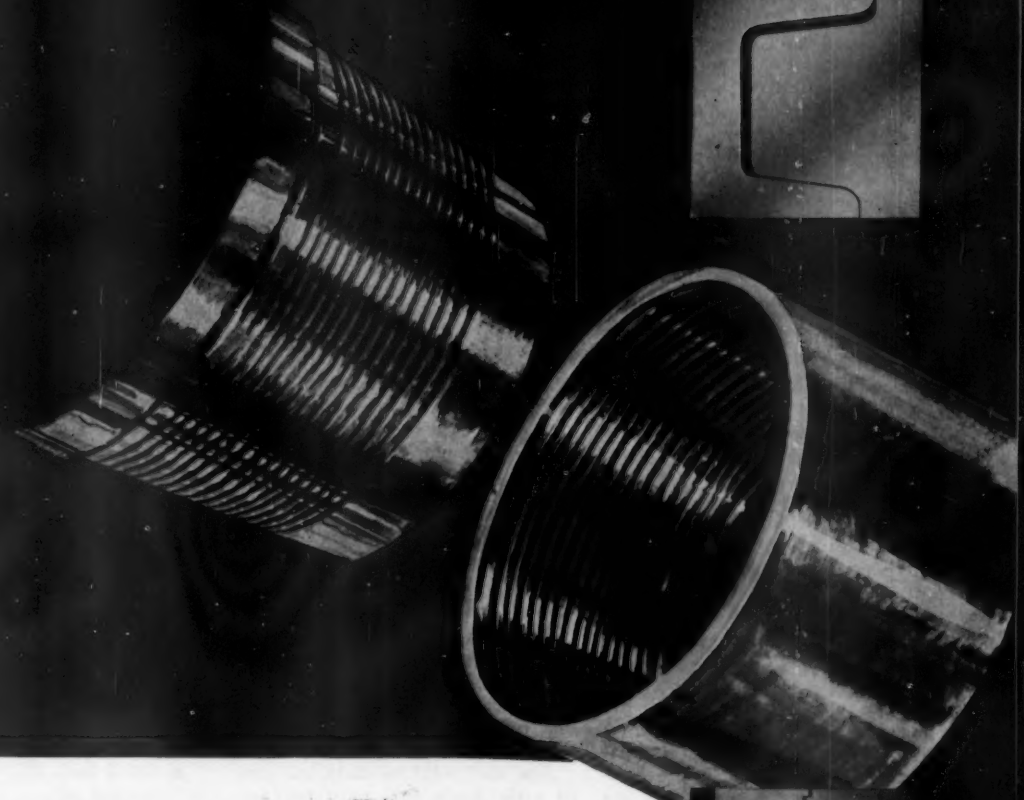

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FOREMAN'S PAGE

FIRE BRICK—PART 2 (CONCLUSION)

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Applying refractory materials

BY J. D. DENTON
A. P. Green Fire Brick Co.

THE EVOLUTION of the heater which is virtually the heart of every refinery process is the most marked change in refractory application.

Years ago the firebrick walls 36 in. in thickness weighed some 450 lb. per sq. ft. and imposed terrific loads on foundations and underpinnings. The furnace quite often rested on the ground which was in the lowland or even swampy.

Today we see panel-type heaters resting on columns. These heaters are off the ground and have more often than not walls less than 1 ft. thick weighing one-third as much per square foot as formerly. These are far more efficient in confining heat.

Panel construction has proved to be a very popular method for enclosing oil heaters and similar furnaces. The structural skeleton of the furnace is required regardless of the method or type of refractories used. With a minimum of design the enclosure can be made up of easily handled panels which can be formed and the refractory can be poured into place in the same manner a portland cement concrete slab or sidewalk is placed.

Anchorage is effected with V-type rod anchors and in some instances two component linings are installed.

A small gap is left at the edge on all four sides of the panel so that no interference occurs during erection. After erection these slots are caulked with a compressible insulation which will also serve nicely as an expansion joint filler.

The plastic-type refractories are anchored into place by metal anchors or refractory anchors, or a combination of both. They, too, are backed up with insulation and afford lightweight, economical construction. As an example, a plastic wall 9 in. thick backed up by 2 in. of block will weigh possibly 110 lb. (as compared to 420 for the 36 in. firebrick wall) and still be 10% more efficient in insulation.

One of the most recent methods of application to be developed is the pneumatic placement or gunning.

Original presentation at WPRA meeting, Casper, Wyo.

Castable refractories are now specifically designed for gun application and they run the complete course as far as properties are concerned.

Insulating castables for backup of dense erosion-resisting castables can be gunned into place. Excellent performance while requiring little time, is the appealing feature of the gunned lining.

A suspended tile lining requires considerable time and expense to install. However, when properly installed, it will render years of trouble-free operation. The new method of using an insulating castable with moderate abrasion resistance and good acid resistance has extended the service of this type lining tremendously. An example where this lining is most popular is in the TCC unit where bead catalysts presents a grinding and rubbing-type abrasion in its travel downwards through the kiln.

The two-component lining also is expensive and requires considerable time to install, yet will render long years of service when installed properly.

Each step in application successively becomes the most important one to a successful service life of the lining.

The shell must be clean and free of scale. Each weld must be carefully inspected for integrity. The failure of a stud or anchor may allow some separation from the shell and possibly progressive separation which will allow bypassing of hot gases. These gases will add the convection value to the conductivity of the lining and hot spots will result.

The insulating castable must be applied with uniformity so that rebounds or "dries" are not entrapped, resulting in voids. Visual inspection during placement followed by hammer tests after curing is of utmost importance.

Welding of the grid steel to the studs is very critical and each weld must be carefully tested.

In the case of shoulder studs where the washers are fastened to the stud either by threads or welding, the security of the fastening must be checked. Where the washer is already fastened to the steam, the insulating castable must be carefully pointed up behind the washer immediately after placement so that no voids exist.

When the dense refractory concrete has been installed, it must be carefully water-cured and then dried out slowly.

The one-shot lining has as its best feature good service for reasonable lengths of time. It requires very little time to install and is relatively inexpensive. It will shorten turnaround time greatly but must be replaced more frequently.

I would like to emphasize that anchorage is of the utmost importance. Even when the correct selection of materials has been made, the refractory enclosure will be no better than the manner in which it is applied.

Good materials with poor anchorage systems invite early distress in the installation.

The selection and application does not differ from any other proper approach to an engineered construction project.

Heat

- How much heat does the enclosure contain?
- What exterior temperature will be permitted?

What thickness of walls is desired?

- What is the minimum or maximum thickness allowed?

Size

- What are the dimensions of the enclosure?
- What is the heat release?
- What loads will the walls, etc., be subjected to?

Operation

- What kind of fuel is used?
- Is there any mechanical abuse in operation?
- Is the operation cyclic or continuous?
- Are any destructive atmospheres present?

These are the major questions which must be answered in order to select the refractory. Quite often these conditions will vary from zone to zone, so this too must be considered.

After carefully studying all the conditions and selecting the correct item, it is only by meticulous workmanship and thorough inspection that we get a good installation.

DOW | HERBICIDES

GARLON . . . *new combination chemical*

knocks out weeds and grasses, costs less than cutting

For getting rid of unwanted vegetation, Garlon* is the one right formulation. It's brand new—and unique—from the research labs of Dow. It contains a special combination of powerful herbicides that control both broad-leaved weeds and grasses. It is a systemic killer—destroys roots and all. And Garlon is easy to use. It mixes readily with water, and seven gallons of Garlon properly diluted with water will effectively treat a full acre of land. Professional contractors like its handling ease—and your own maintenance men can apply Garlon and obtain good results.

Some gas and oil companies are still using mowers and man hours to get rid of nuisance weeds and grass around tank farms, pipe lines, storage and equipment areas. But cutting is more expensive and far less satisfactory than spraying with Garlon. Cost comparison figures show that savings are substantial when you switch from cutting to spraying. For more information on chemical control of vegetation and/or the name of a qualified professional contractor near you, send the coupon below to THE DOW CHEMICAL COMPANY, Midland, Mich., Agricultural Chemical Sales Dept. 207DC-4-20

*TRADEMARK OF THE DOW CHEMICAL COMPANY

The Dow Chemical Company
Agricultural Chemical Sales Dept. 207DC-4-20
Midland, Michigan

☐ Please send me additional information about Garlon and modern vegetation control chemicals.

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THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Gas-engine-driven compressor

. . . has been redesigned. Built for the intermediate horsepower range, the Model HRA-T unit is turbocharged and employs heavy-duty construction. To handle a heavier horsepower load, all vital parts, including the crankcase, bed section, pistons, crossheads, and running gear, have been made larger and more rugged. The turbocharger is jet-air-started and completely self-sustaining at normal speeds. Scavenging cylinders have been eliminated. Brake mean effective pressure rating is 92 psi.

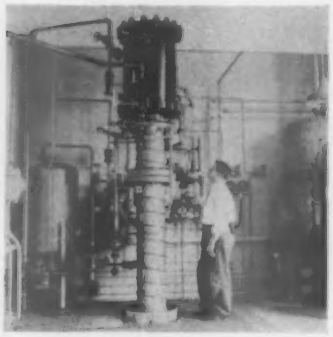
With a bore and stroke of 14 by 14 in., the machine is built with four, five, six, and eight power cylinders with ratings from 660 to 1,320 hp. Two companion nonturbocharged units are also available. They are rated at 750 and 1,000 hp. Source: **Clark Bros. Co., Dept. OGJ, Olean, N. Y.**

All-electric gas-flow computer

. . . is now being placed on the market to automatically and continuously measure mass flow of gas under standard conditions. The basic system comprises a differential-pressure transmitter, absolute-temperature sensing device, absolute-pressure transmitter, analog-computing circuit, and an electronic circular or strip-chart recorder.

In addition to such functions as indication, recording, control, and integration, the computer can be coupled to telemetering and remote-control systems, supervisory control, data handling, and process computers.

One big advantage of the system is that it offers a way to do away with daily chart changing and manual hourly flow calculations. Too, by continuously correcting flow measurements for all variables, it will provide the higher accuracy required for economic gas dispatching and accounting procedures as compared with present means. Though designed originally for natural-gas industry use, the computer can be applied to flow measurement in chemical plants and refineries. Source: **Brown Instruments Div., Minneapolis-Honeywell Regulator Co., Dept. OGJ, Wayne & Windrim Avenues, Philadelphia 44.**



Spiral condenser for vapor processing

. . . recently disclosed consists of two duct-like spiral passages wrapped up to form two continuous passages of rectangular cross-section. The spiral design permits the condenser to be installed as the top section of a column or for direct connection to the vapor-outlet nozzle of a vessel. Economy is achieved through the elimination of elaborate supporting structures, large-diameter vapor lines, and other auxiliaries essential to conventional designs.

Vapor path can be full countercurrent spiral flow, combined crossflow-spiral flow, or full crossflow. The spiral condenser can be obtained for total, partial, reflux, vent, or knock-down condensing services in sizes from 15 to 1,600 sq. ft. and for pressures to 150 psi. It can be fabricated in any material that can be cold-formed and welded to ASME Code requirements. Source: **American Heat Reclaiming Corp., Dept. OGJ, 1270 Sixth Avenue, New York, N. Y.**

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number:.....

.....

Described in OIL AND GAS JOURNAL - Issue of **October 12, 1959**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

Fast cycle time is built right into the John Deere 831 Loader; the optional clutch-type direction reverser on the tractor speeds work still further.

The John Deere 50 Backhoe digs as deep as 13-1/2 feet, dumps as high as 11 feet, and has a full 205-degree boom travel.

with the JOHN DEERE *DIESEL* Backhoe-Loader

You come up a winner every time with a John Deere Diesel Backhoe-Loader outfit. Fast digging, loading, and backfilling at a lower cost than you thought possible, plus rock-bottom maintenance and servicing costs keep you on top of job schedules and well inside even the tightest budgets.

The Loader Side of the Story

Compact and highly maneuverable, this new Diesel Crawler-Loader is tailor-made for getting top production out of tight spots.

Fast cycle time is built right into the bucket linkage. When bucket is dumped from the full-height position, it returns to the 9-degree digging angle *by use of the boom-control only*. Leveling out a spot? Again, use of the boom-control is all that's required. Operating cycle time is further cut with the John Deere clutch-type direction reverser.

The Backhoe Side of the Story

The new center-position backhoe takes full advantage of the increased engine horsepower built into every John Deere "440" unit, gasoline or Diesel. There's plenty of crowd pressure and bucket roll-back to make fast work of digging in hard or frozen soils. And to speed work further, all movements of boom, dipper stick, and bucket are operated by simple, 2-lever control.

Low mounting of the rotary boom cylinder provides good visibility, improves balance for transport. Wide range of bucket sizes available.

John Deere Industrial Division
Dept. 550, Moline, Illinois

JOHN DEERE — *"Specialists in Low-Cost Power with a Heavyweight Punch"*

New trucks come in 480 models

. . . to give operators a wide choice for specific trucking needs. The Ford trucks range in gross vehicle weight from 4,600 to 51,000 lb. with gross combination weights up to 76,000 lb. New features stressed include increased fuel economy, optional axles, and advancements in frame strength, wiring systems, brake linings, oil pumps, generators, ignition distributions, and fuel pumps.

For the heavy and extra-heavy trucks, five different engines are available. Engines for the light and

medium-duty trucks include a six-cylinder engine with 223 cu. in. piston displacement and a V-8 engine with 292 cu. in. piston displacement. Source: **Ford Div., Ford Motor Co., Dept. OGJ, P. O. Box 608, Dearborn, Mich.**

Plasticap coatings give you

ACES BACK TO BACK

Your ace in the hole is the Plasticap baked on plastic coatings that eliminate replacement of corroded pipe and fittings. Backing it up you'll find field office service and follow-up. With 3 plants and 8 offices strategically located to serve you, the man from Plastic Applicators is always Johnny-on-the-spot.

Plasticap

PLASTIC APPLICATORS INC.

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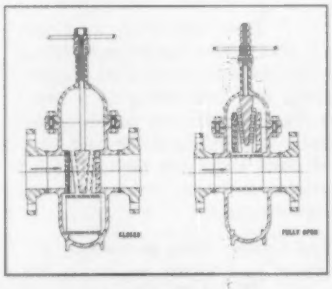
Midland, Texas | Hobbs, N. M. | Shreveport, La.
Dallas, Texas | Houma, La. | Lafayette, La.
Corpus Christi, Texas | Tulsa, Oklahoma | New Orleans, La.

Crane pinpoints loads accurately

. . . to within 0.008 in., the maker claims. The crane is a pedestal-mounted electric-powered type. With a capacity of about 6 tons, the crane is especially adapted for use in crowded areas where space is a premium. Production models have been extensively tested in plants, offshore drilling platforms, and in confined outdoor pipehandling operations.

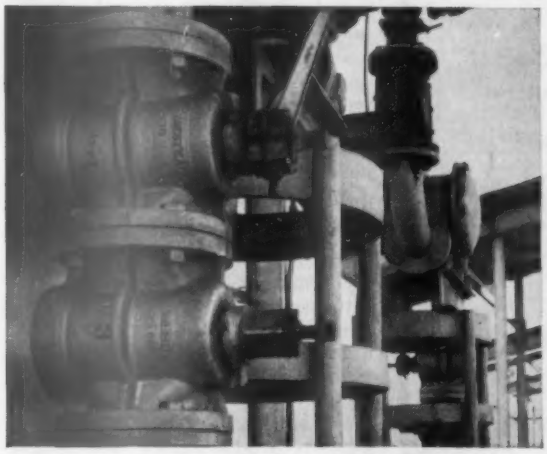
The unit's spotting ability is achieved through a system of localized power in which electric motors are spotted at every point where power is needed. Hoisting, luffing, and swinging functions are each powered by individual a.c. gearmotors. They are operated separately or simultaneously from a small remote control box. Limit switches in the circuits prevent overtravel of components. Each gearmotor is equipped with electro-magnetically controlled spring-loaded brakes. They release when the motor control switch is pressed and engage when it is released. Source: **R. G. LeTourneau, Inc., Dept. OGJ, 2399 South MacArthur, Longview, Tex.**



Gate-valve assembly operates easily

. . . for a tight seal. The antifriction unit employs a self-sealing synthetic rubber seal gasket and consists of a tapered-wedge assembly mounted on roller bearings that controls the movement of the valve disk. Initial closing

Homestead Plug Valves Help to Keep Aviation Gas Pure at Naval Air Base, Norfolk



3" Homestead Lubricated Plug Valves handling gasoline on tank truck loading docks at Naval Air Station, Norfolk

Aviation gasoline must be kept free of contamination. That's why fuel lines on truck or ship loading docks, and on underground storage tanks, are so often controlled by Homestead Lubricated Plug Valves.

Controlled pressurized lubrication system and extremely close tolerance between plug and body, prevent lubricant from being extruded into line—prevent contamination of gasoline. Add Homestead's reinforced Teflon* head seal and double ball check valve, and you have a truly dependable plug valve—one that opens quickly and fully for fast loading; closes quickly and tightly for positive fluid control.

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and opening of the disks is in a horizontal plane, directly against or away from the valve seats. Thus the disks do not drag across the seat. The unit is designed for valve sizes of 2 through 30 in. in cast steel, cast iron, cast aluminum, and bronze. Working pressures range from 0 to 10,000 psi. with temperature ranges from 350° down to -60° F. Source: **Charles Wheatley Co., Dept. OGJ, 414 South Detroit, Tulsa.**

Oil-field automatic control system

. . . recently developed allows centralized recording of data from up to 800 wells in 20 leases scattered over many miles. The JS10AD controller accumulates test flow data from the lease test separator and, at conclusion of testing any well, signals the data-receiving central control that it has information to report. On a return signal from the central control, the transmitter reports the lease, codes the well number as indicated by the well-test control, and then sequentially reads the counters. These give the

length of the test to 0.01 hours, total flow of gas in cubic foot per minute, and oil and water quantity in barrels.

Three-position switches permit automatic sequenced testing of wells, skipping of any wells, and manual control when desired. Optional equipment can be included in the system to report total lease production in barrels, total oil shipped as picked up from an automatic custody transfer unit, and any number of alarm conditions. Source: **General Controls Co., Dept. OGJ, 801 Allen Avenue, Glendale, Calif.**

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WORLD'S LIGHTEST-STRONGEST PORTABLE HOUSING UNITS

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SOLD THROUGH YOUR SUPPLY STORE

*Prices subject to change

Rotary reamer cutter to cut costs

. . . of drilling in hard formation has been developed. The knobby reamer cutter uses tungsten carbide compacts for reaming in the harder formations. The maker reports field tests have shown that 1 set of knobby reamer cutters will replace 4 to 10 sets of conventional type of cutters in lime, dolomite, and chert drilling in the Mid-Continent area.

The compacts are much harder than the formation being drilled. This enables the cutter to readily crush the harder rocks. The maker cites a number of advantages for the tool. These include: (1) a full-gage hole at the reamer, even when the rock bit has lost gage badly, (2) increased bearing life by concentrating the crushing load at the tips of the carbide compacts instead of permitting the formation to press against the entire length of the cutter face, and (3) underreaming of the hole by using spacing between the carbide compacts on the cutter to allow the reamer to be run in the hole slightly overgage. Source: **Drilco Oil Tools, Inc., Dept. OGJ, Drawer 3135, Midland, Tex.**

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Are you aware of the tremendous difference a small amount of Unicor can make in pipelines and crude units?

This film-forming, oil-soluble inhibitor prevents all kinds of corrosion. Wherever Unicor has plated out on a surface, it gives protection to tanks, vessels and pipelines whether full, part-full or empty.

By adding a small amount of Unicor to your product—10-20 parts to a million—you prevent product contamination, profit-robbing corrosion; assure maintenance of full-flow capacity and output.

Furthermore, use of Unicor substantially reduces filter cleaning and replacements, scraping operations, power costs and expensive downtime.

What Unicor does for tanks and pipelines it also accomplishes in crude units and other refinery equipment. For detailed information, write to our Products Department.

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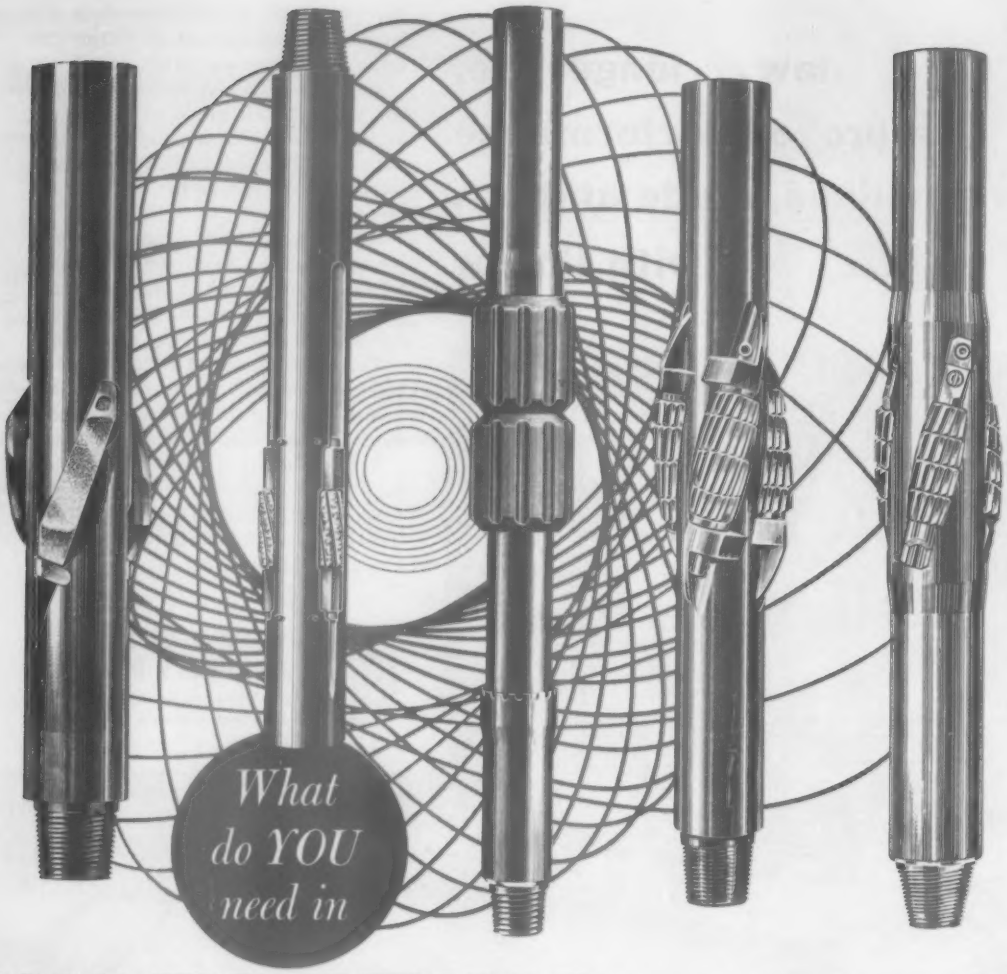

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There are not just one or two—but *five*—distinct types of Grant Drill String Stabilizers to meet every drilling requirement... every well condition... and every operator preference.

For reaming *and* stabilizing—Grant has perfected the Model 1530, Model 6480-A and Model 2020 Reamers for use in the drill collar string for maximum stabilization and round, full gauge hole.

For stabilizing *only*—Grant provides the Cushion Stabilizer and the Drilblade. Each assures proper drill string stabilization for faster penetration without increased weight on the bit.

Whatever your stabilizing requirements, just remember that, when it comes to stabilizing tools, *only Grant makes them all!*

This is just one of the three *families* of Grant Tools made for reaming, hole enlarging and stabilizing. For full information on these, and a wide range of other down-hole and surface tools made by Grant, send for your copy of the complete Grant Catalog *today!*

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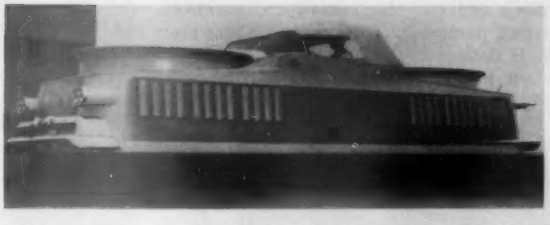
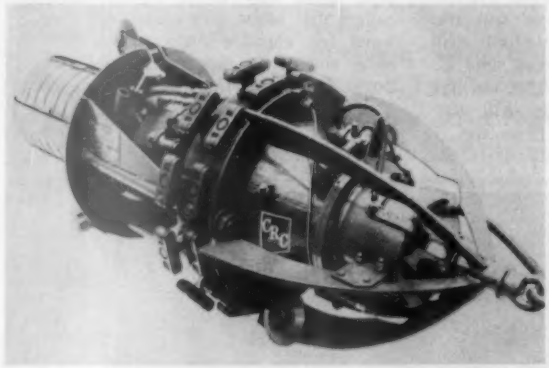


Air car unaffected by mud, water

. . . swamps or other unobstructed terrain as it travels in the air at a height of 6 to 12 in. Scheduled for production in November, the Model 2500 Air-Car is powered by a conventional 300-hp. engine through a reduction gear. Suspension is accomplished by keeping about 1/10 psi. pressure under the vehicle. This is aided by a deflection membrane. The low-pressure, low-velocity air is also used for propulsion and braking.

Capable of hauling four passengers, the newest model will be 21 ft. long, and 8 ft. wide. It will weigh about 2,800 lb. with four passengers and a full gasoline load. Speeds up to 60 m.p.h. are possible.

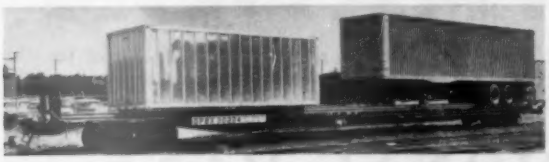
According to the maker, the Air-Car is inherently stable and can be operated by anyone who can drive an automobile. Source: **Curtiss-Wright Corp., Dept. OGJ, Wood-Ridge, N. J.**



Air operates pipe line-up clamp

. . . just developed for 20 through 36-in. pipe. Providing fast operation, the Air Clamp clamp is designed around rollers which roll pipe into near perfect roundness without friction or sliding of the clamp on the pipe surface.

The pneumatically controlled heads operate independently. Thus, the back head of the clamp can be locked in position to prevent the clamp from rolling back into the pipe while a new section of pipe is placed in position. A large air tank is used to allow several lineups without repressuring. All working parts are totally enclosed. Source: **Crutcher-Rolfs-Cummings Inc., Dept. OGJ, Box 2073, Houston**



"Piggy-back" railroad car developed

. . . that promises faster and more efficient shipment of highway hauling equipment as well as containers and tanks. The G-85 car is so designed that no special tools or equipment are needed for tiedown. Containers of any length can be handled without special terminal facilities such as cranes. Containers can be carried alone or on their chassis. Shock ab-

Control LOST CIRCULATION better with

MASTERPLUG*

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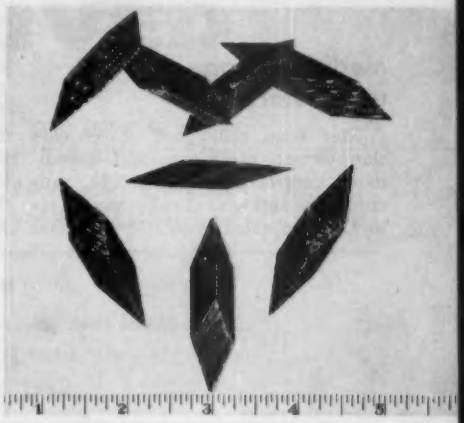

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MASTERPLUG* is a pointed wedge shaped plug designed specifically to establish an initial bridge in large fractures. Added to any sealer it will greatly increase its bridging ability. It mixes easily in the suction pit and pumps without difficulty or damage to mud pumps. Reasonably priced. Masterplug is currently being used in the Rockies, Texas and Oklahoma with outstanding success. Send for descriptive literature, samples and case histories. Our field representatives are available to discuss your lost circulation problems without obligation. Contact us now.

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sorbers cushion the trailers and containers, minimizing impact.

The big advantage of the new car is the opportunity it offers to save time and manpower in loading and unloading as compared with present means. Without leaving the cab of his truck, the driver can handle all tiedown operations using a new hitch that operates automatically. No special terminal facilities or lifting equipment will be needed for either trailers or containers. Removing a trailer is simple. The driver just backs up the trailer. As the tractor hits the hitch, a fifth wheel engages the kingpin and the hitch automatically drops below the top of the car's center sill. The 85-in. car can carry a payload of 150,000 lb. The payload can be two 40-ft. trailers or containers or four 20-ft. containers. Source: **General American Transportation Corp., Dept. OGJ, 135 South LaSalle Street, Chicago.**

•

Medium-voltage a.c. motor starter

. . . has been redesigned to provide short-circuit protection and coordinated control for squirrel-cage, synchronous, and wound-rotor motors up to 3,000 hp. rated from 2,300 to 4,600 volts. The Limitamp control is suited for use in petrochemical plants, refineries, and pipeline stations and on drilling rigs on motors driving pumps, compressors, and rigs. It is designed for either indoor or outdoor location and is highly resistant to corrosive atmospheres.

A novel drawout stab-in contactor and fuse assembly are incorporated for fast, positive connections. According to the maker, the starter can be installed in half the time necessary for previous models. Source: **General Electric Co., Dept. OGJ, Schenectady 5, N. Y.**

Machine eases drillpipe handling

. . . and offers a way to eliminate the time-consuming cat-line handling of material to and from the elevators. One workman controls the material flow with this new pipe and rod-handling machine. Cable-tool drillers, well-service companies, and rotary operators will find the machine useful in moving casing, drill pipe, and sucker rods to or from the rig elevators to the pipe rack. It is also adaptable to small rotary drilling units for handling drill pipe.

Pipe rolls onto the machine from pipe racks and lands on actuating rollers that allow free movement forward for elevator engagement. The outer end of the pipe rides a dolly to the inner end of the machine located at a convenient operating distance from the well. Pipe being lowered onto the machine from the elevators

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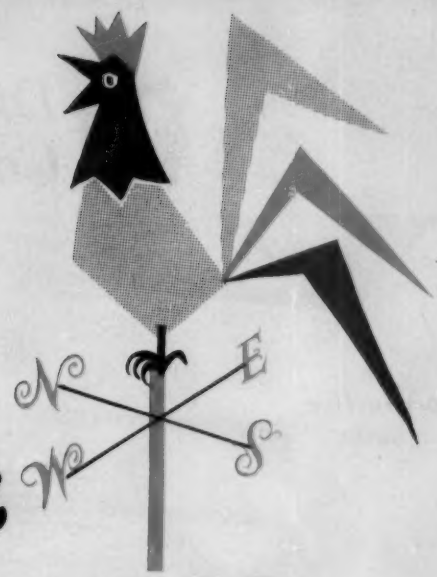

Cooper
DOUBLES RIGS
HAVE ARRIVED

In only a few months Cooper Skytop Rigs have gone to work in Louisiana, East Texas, West Texas, Gulf Coast, Texas Panhandle, Mississippi, Montana, North Dakota, Wyoming, Oklahoma, Canada, and Mexico. But that's not all, many more are on the way because Cooper Skytops are setting new standards for oil well servicing. If they are not now working near you they will be soon.

Watch for them and see them work. Then you will know why these rigs are called the hottest unit to hit the oil fields since Cooper Winch Tractors changed well servicing ideas in 1918.

USERS SAY THEY LIKE . . .

"Racking pipe in doubles."
"Derrick hydraulic system for power subs, tongs and other power tools."
"No more load guylines to the ground."
"They handle any load so easy."
"Have real field portability."
"Time saved doing the job."
"Fast, easy rig up and rig down."
"Highway travel without special permits."

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FRED E. Cooper, Inc.

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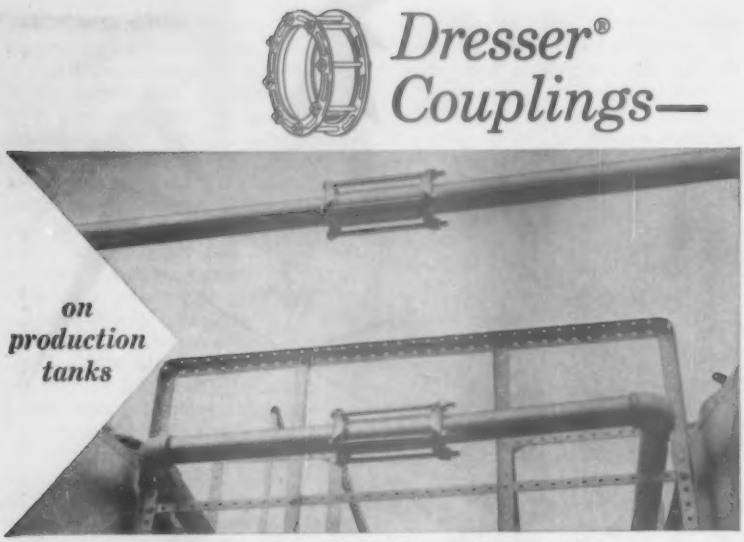
Branches: Houston, Odessa, Olney



simple, economical...

safe, permanent joints!

Dresser Couplings make safe, permanent joints with only a simple hand wrench in two man-minutes per bolt. This is a *part* of their economy . . . no specialized tools or labor. You save even more because the Dresser Coupling is used with plain end pipe. The specially compounded Dresser Gaskets allow up to 4° pipe deflection at every joint, saving delays caused by misaligned pipe. Take-down ease and re-usability are tremendous assets in moving pipe, and in adding new pumps, valves, or branch and connecting lines. Send for Dresser Catalog No. 531 . . . information and specifications on *all* Dresser Couplings, Fittings, and Pipe Repair Products.

• GET THEM FROM YOUR LOCAL OIL FIELD SUPPLY STORE

Bradford, Pennsylvania
Chicago
Houston
New York
S. San Francisco
Toronto & Calgary

DRESSER
MANUFACTURING DIVISION
ONE OF THE DRESSER INDUSTRIES

lands on the same rollers where it can be easily moved outward to match other racked pipe ends. It then may be positioned right or left onto the pipe rack by foot pedals.

The machine measures about 25 ft. long, 14 in. high, and 14 in. wide. It weighs about 1,000 lb. Price is about $1,500. Source: **Independent Tank Co., Dept. OGJ, Box 1354, Seminole, Okla.**

•

Machine embosses cards from tape

. . . providing an automatic flexible method for producing embossed plastic credit cards and other types of embossed cards from punched tapes or punched cards of electronic computers and accounting machines. The Datatyper 410 operates at an average speed of 14,000 characters an hour in embossing plates or cards used in industrial payroll and stock-control systems and in credit card plans. Operation of the embossing head is electronically controlled and electrically operated.

Flat surfaces of embossed characters on a plate are completely level. The machine creates a full, semi-coined impression which can be regulated up to 0.035 in. to a tolerance of 0.0005 in. It is considered to be the first machine of its type capable of handling stainless-steel plates. Price of the basic unit is $14,000. Source: **Dashew Business Machines, Inc., 5886 Smiley Drive, Culver City, Calif.**

•

New ink for recorder ball pens

. . . has been compounded which, the maker claims, eliminates the problems formerly connected with ball-pen operation in recording instruments. The ink is compounded to eliminate impurities or air bubbles, major causes of poor pen performance. The ink operates at high temperature and with light point pressure. Source: **Formulabs, Inc., Dept. OGJ, Escondido, Calif.**

Chicago Pneumatic

FORT WORTH, TEXAS

BITS FOR ALL FORMATIONS

TOOL JOINTS

THREE CONE BITS

REAMERS

Cost-cutting Performance

31 YEARS OF SERVICE TO THE PETROLEUM INDUSTRY

DRILL COLLARS

REAMING BITS

Up to TWICE the YIELD per dollar invested!

The Adsorption Process
DELTA'S

DRYEX

GASOLINE PLANT

***GUARANTEES**

Lowest Product Recovery Cost
Shortest Unit Payout Time

- A new concept for natural gasoline, butane and propane recovery.
- Recovers *both* natural gasoline and NGAA specification butane and propane.
- You get more product at a much lower cost (half in many cases) than any other commercial process.
- You are assured of shortest unit payout time.
- Dryex adsorption gasoline plants are complete including fractionation and refrigeration equipment—which yield NGAA specification products.

Dryex gasoline plants open a new realm of profit possibilities. Even those gas streams considered for other processes in the past and eliminated as economically impractical should be reviewed for a Dryex gasoline plant application.

DELTA

DELTA TANK MANUFACTURING CO., INC.

BATON ROUGE, LA. • BEARDSTOWN, ILL. • MACON, GA.

LET DELTA ANALYZE YOUR GAS STREAM TO DETERMINE THE VALUE OF DRYEX TO YOU

New Literature

Revised 52-page thermocouple catalog

. . . lists and describes conventional assemblies in protecting tubes and wells for general applications; specialized thermocouples and assemblies for laboratory and industrial applications; and bare and insulated thermocouple wires, replacement elements, ceramic insulators, metal and ceramic protecting tubes, wells, terminal heads, and extension lead wires.

Catalog EN-S2 gives recommendations on the choice and use of thermocouples and assemblies and on the limitations of protecting tube and well materials. Source: **Leeds & Northrup Co., Dept. OGJ, 4934 Stenton Avenue, Philadelphia 44.**

Guide to refrigerated purging

. . . presents data on the automatic removal of air from refrigeration systems. Twelve-page Bulletin 700 tells why purging is necessary, how noncondensible gases affect efficiency, gives methods of purging, and tells where to make purge connections and how to use the refrigerated purger. Source: **Armstrong Machine Works, Dept. OGJ, Three Rivers, Mich.**

Men, Methods, and Machinery

. . . is the title of a new 52-page brochure giving pictorial case histories of operation methods and equipment used on various unusual and challenging construction projects. The publication tells how a corporation devised cost-cutting solutions for difficult engineering problems encountered all over the world.

Also included is the complete history of the Sensibar Sandfill method; land reclamation and stabilization; hydraulic stripping and dredging; and site preparation for industrial plants. Source: **Construction Aggregates Corp., Dept. OGJ, 120 South LaSalle Street, Chicago 3.**

Industrial hose and fittings

. . . catalog features 128 pages of specifications, technical data, sizes, descriptions, applications, and installation instructions on hose and hose assemblies, brass and steel-tube fittings, hose and tube-working tools, stock cabinets, hose racks, and other specialty products. The catalog is designed to help users of hydraulic, air,

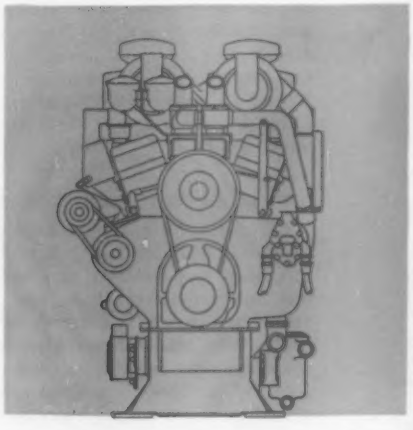
Full-time, low-cost
"BABY-SITTER"
with finest references!

Penn Safety Controls will "baby-sit" your costly engines 24 hours a day with complete safety! Even in the best of engines overheated cooling water or oil pressure failure can develop. When it does, Penn Controls automatically warn you of the trouble or stop the engine, whichever you prefer. Learn more about this low-cost protection for new or old engines. Write for full information.

PENN CONTROLS, INC. Goshen, Indiana
EXPORT DIVISION: 27 E. 38th ST., NEW YORK, N. Y.
AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

CUMM
V-12 DI

COST LESS . . . WEIGH LESS . .



VT-12 SPECIFICATIONS

Max. h.p.	600 at 2100 r.p.m.
No. of cylinders	12
Bore and Stroke	5¼" x 6"
Displacement	1486 cu. in.
Compression ratio	13.5 to 1

MINS
IESELS

. . EARN MORE PROFIT FOR OIL MEN!

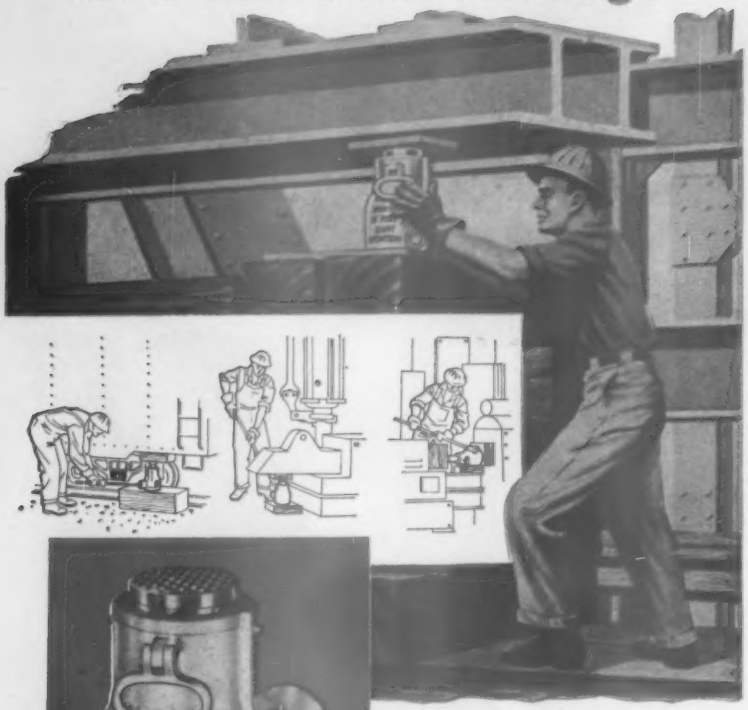
You can save as much as $10,000 per power unit when you specify Cummins V-12 Diesels over comparably rated medium speed (1100-1300 rpm) diesel engines for either torque converte, or electric drilling rigs. You also get the quality and features that have made Cummins world famous.

Cummins V-12 Diesel drilling units weigh approximately 40% less per h.p. delivered than medium speed engines of comparable rated h.p. This means a high degree of portability permitting extra savings in lighter equipment—faster move and rig-up time. Choose from two models—the 450 h.p. NVH-12 or the 600 h.p. VT-12. Rely on the experience of thousands of men who have utilized more than a million V-12 horsepower over the last 10 years. Either model delivers the low-cost dependable performance that means more profit!

CUMMINS

Cummins Engine Company, Columbus, Indiana

200,000 Pounds Of Lifting Power In a 98 Pound Package



The 100 ton capacity Duff-Norton Aluminum Screw Jack weighs only 98 pounds. It is easier to handle and spot than any other type of jack of the same capacity which may weigh two to five times more.

Maintenance is virtually eliminated by the rugged construction—aluminum alloy housing and base—heat-treated steel lifting screw—sealed-in lifetime lubrication. This enables these jacks to withstand hard usage in any weather without damage.

The design of these jacks makes it impossible for them to creep—will support load indefinitely. They can be used in any position—have no fluid to leak—no air to lock. Duff-Norton Screw Jacks are ideal for heavy riggers or for construction and maintenance crews in shipyards, steel mills and other industries.

Duff-Norton Screw Jacks are available in 25, 35, 50 and 100 ton capacities in aluminum—in 15, 25, 35 and 50 ton capacities in malleable iron. For full details on these durable, all-purpose lifting jacks see your favorite supply store or write for Bulletin AD-12b.

DUFF-NORTON COMPANY

P. O. Box 1889 • Pittsburgh 30, Pennsylvania

COFFING HOIST DIVISION • Danville, Illinois

DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

and fluid systems find items needed quickly and easily. Source: **Weatherhead Co., Dept. OGJ, 128 West Washington Boulevard, Fort Wayne, Ind.**

Licking Fretting Corrosion

. . . in Variable-Speed Sheaves is the title of six-page Folder 7102 obtainable gratis upon request. Fretting is identified simply as old-fashioned wear—specifically the wear between two members under pressure which move microscopically relative to each other. Corrosion then enters the picture when one or both of the wearing members are made of oxidizable material, usually iron or steel.

As the moving parts fret, tiny particles of metal are worn off. These readily oxidize into rust, according to the literature. With this background in mind, the bulletin lists several ways in which wear by fretting corrosion can be controlled. Source: **T. B. Wood's Sons Co., Dept. OGJ, Chambersburg, Pa.**

Compressed-air fundamentals

. . . is the topic of new Bulletin 1548, published to help you select small packaged air compressors. The literature describes compressed air, tells how it is compressed, and gives information on single and two-stage compressors, piston displacement, actual delivery, unloading of compressors, regulation, and types of control used.

It also discusses compressor oils, pipe and wire sizes, and terminology and definitions used in connection with the compression of air.

The bulletin includes: (1) tabular and chart information on cubic feet of air required to operate a variety of pneumatic equipment; (2) average and continuous air-supply tables; (3) cylinder diameters required to develop power to overcome indicated loads; (4) volumes of compressed air required per stroke to operate various-size air cyclinders; (5) a chart on ratios of compression; and (6) tables on flow of air through orifices. Source: **Ingersoll-Rand Co., Dept., OGJ, 11 Broadway, New York City.**

Mineral-products reference booklet

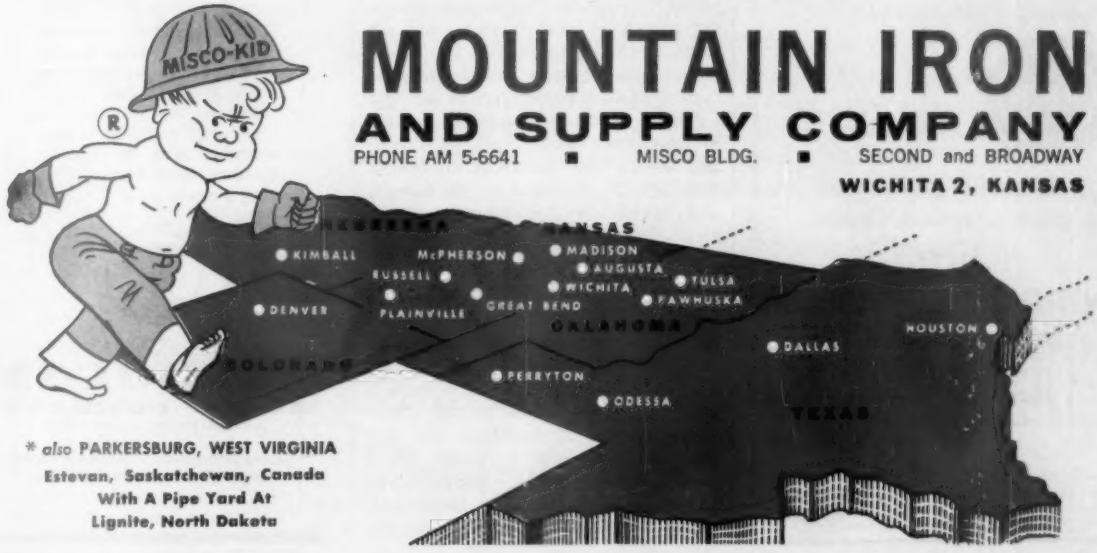
. . . presents physical and chemical properties of aluminum silicate pigments, attapulgus clays, activated bauxites, and limestone. Characteristics of the various grades of each mineral product are presented in tabular form for quick reference. Typical applications are included. The eight-page booklet also lists names and ad-

MISCO-On Target

WITH THE BEST OIL FIELD SUPPLIES

The right supplies, at the right place, and at the right time can make the difference between profit or loss. For dependability make the MISCO KID your supply man. You will find him anxious to serve you from any of these locations in Misco Land. You'll enjoy the friendly, courteous service you receive, and you'll learn why MISCO is America's fastest-growing supply company.

YOUR *Friendly*
SUPPLY COMPANY



MOUNTAIN IRON
AND SUPPLY COMPANY

PHONE AM 5-6641 ■ MISCO BLDG. ■ SECOND and BROADWAY
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* *also* **PARKERSBURG, WEST VIRGINIA**
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Foremost Producer of Steel Pipe & Tube of All Types

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New York Office:
Room No. 1115, 39 Broadway,
New York 6, N.Y., U.S.A.

dresses of 35 distributors in the United States and Canada. Source: **Minerals & Chemicals Corp. of America, Dept. OGJ, Essex Turnpike, Menlo Park, N. J.**

Practical wiring tips

. . . are contained in a vest-pocket sized 36-page literature piece. It gives some 25 time-saving uses of connectors for solderless wire-splicing and termination. Illustrated with over 70 drawings, the 2 by 3-in. publication offers examples of many jobs that can be done with one hand-crimping tool.

Included is a chart showing wire combinations approved by UL and CSA for splice caps, together with descriptions of connectors and terminal blocks. Source: **Buchanan Electrical Products Corp., Dept. OGJ, Hillside, N. J.**

Bulletin describes pipeline meter

. . . with a capacity of 15,000 bbl. of liquid per hour, applicable for barge loading, custody transfer, and pipeline control. The Turbo-Meter is designed to handle both crude and refined products.

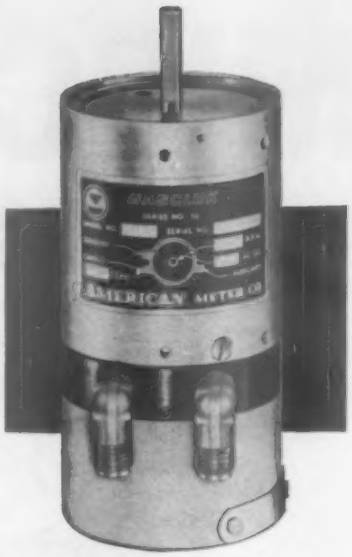
Twelve-page Bulletin OG-417 lists functions, applications, detailed cutaway drawings, accuracy and head-loss curves, accessories, and specifications. Source: **Meter & Valve Div., Rockwell Mfg. Co., Dept. OGJ, 400 North Lexington Avenue, Pittsburgh 8.**

Gamma-radiation measuring systems

. . . for density or specific gravity and liquid-level control are outlined in new six-page Bulletin 105-C now obtainable. The literature details operating principles, performance, and advantages of gages, designed to provide continuous, accurate, and automatic control of such parameters as per cent solids in a slurry, interface passage in pipelines, liquid level in vessels and towers, and control of the output densities of evaporators, thickeners, and dryers. Source: **Ohmart Corp., Dept. OGJ, 2236 Bogen Street, Cincinnati 22.**

Solid-state computing device

. . . for mathematical calculations is illustrated in a new two-page brochure. The publication lists technical data and specifications of the CM-2 analog computer. Included are special amplifiers and networks which are available. Source: **Southwestern Industrial Electronics Co., Dept OGJ, 10201 Westheimer Road, Houston 27.**



AMERICAN®

GASCLOK POWER DRIVE

Completely self-contained gas or air-powered instrument driving and timing unit for long, trouble-free operation in remote locations. The GASCLOK delivers more than 20 times the torque of conventional spring-wound mechanisms. Continuous timing accuracy is unaffected by a ± 20% variation in supply pressure.

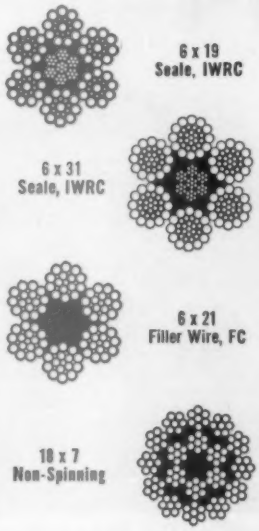
Inherently explosion proof and self-starting, the GASCLOK is ideal as original or replacement equipment for strip chart and conventional circular chart instruments. The timing mechanism is internally sealed to prevent corrosion, and all power unit parts exposed to gas are aluminum or stainless steel. Large area internal ports prevent clogging. Normal air or gas consumption 5 cfh . . . operating pressure 5 psi . . . rotation 2 rpm.

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

Executive Offices: Philadelphia 16, Pa.
Sales offices in principal cities.

YOU CAN'T BARGAIN WITH SAFETY

WICKWIRE ROPES FOR PETROLEUM DRILLING



For detailed recommendations on Wickwire Ropes for drilling equipment, write the nearest CF&I sales office and ask for WR 735.

For safety and performance . . . order CF&I-WICKWIRE *"job-designed" wire ropes*

The Image of CF&I—a giant steelman—stands for the rigid quality-controls and testing procedures that are carried out in the production of Wickwire Rope. This Image also reflects CF&I's ability to design a specific product to meet a particular need.

These are the very reasons why CF&I-Wickwire Ropes are both *safe*—as only a *quality* wire rope can be—and *suitable*—because they are available in a *complete range* of wire grades, types, sizes and constructions, designed to meet each industry's requirements.

Avoid the losses—due to injuries and wrecked equipment—that can occur when a "bargain" rope fails. Buy a quality wire rope that's designed for the job it must do—a CF&I-Wickwire Rope.

WICKWIRE ROPE
THE COLORADO FUEL AND IRON CORPORATION

CF&I STEEL

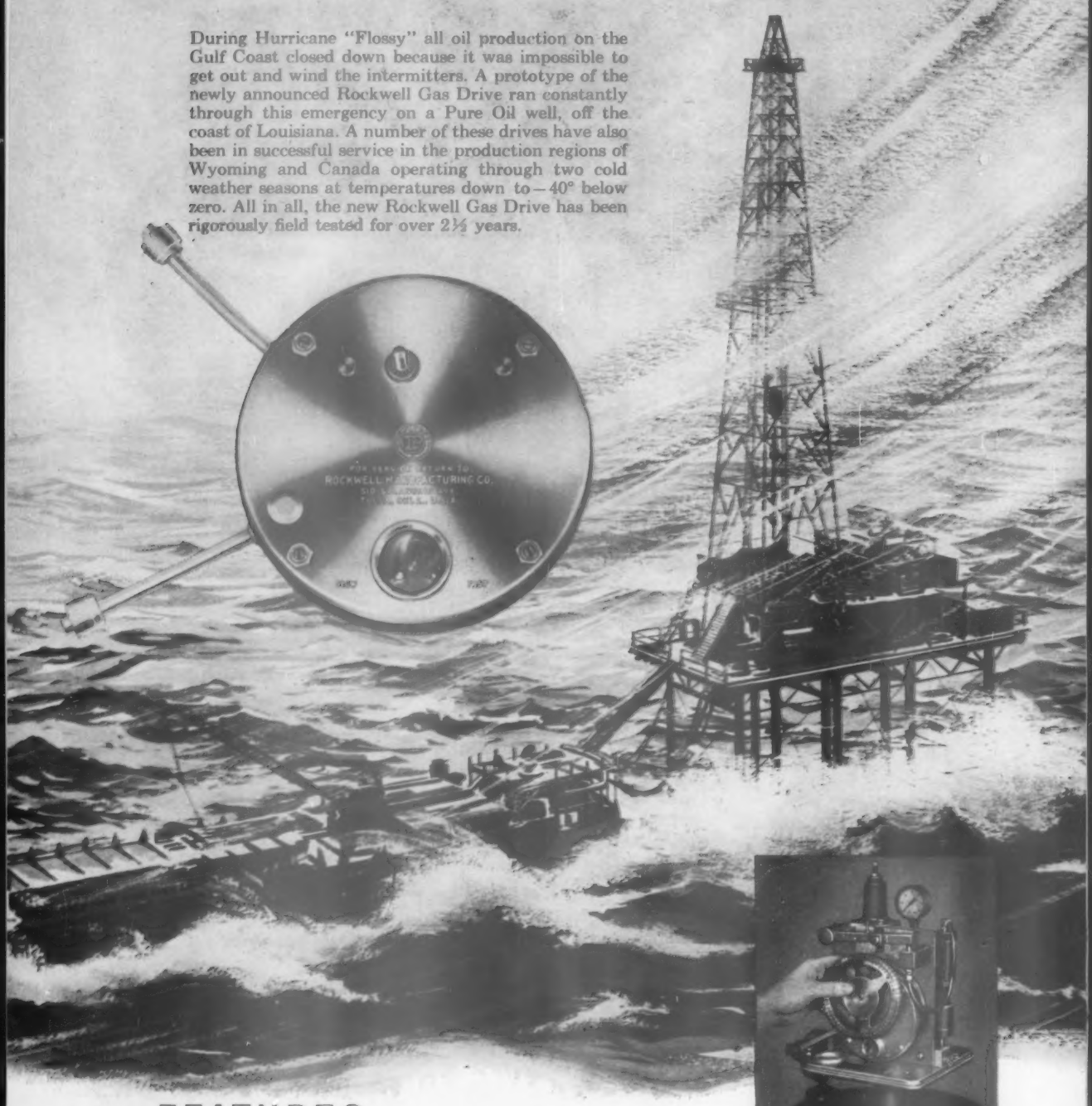
In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque • Amarillo • Billings • Boise • Butte • Denver El Paso • Farmington (N. M.) • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Odessa (Tex.) Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Tulsa • Wichita

In the East: **WICKWIRE SPENCER STEEL DIVISION**—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) New Orleans • New York • Philadelphia

6794-D

The only chart drive that

During Hurricane "Flossy" all oil production on the Gulf Coast closed down because it was impossible to get out and wind the intermitters. A prototype of the newly announced Rockwell Gas Drive ran constantly through this emergency on a Pure Oil well, off the coast of Louisiana. A number of these drives have also been in successful service in the production regions of Wyoming and Canada operating through two cold weather seasons at temperatures down to −40° below zero. All in all, the new Rockwell Gas Drive has been rigorously field tested for over 2½ years.



Rockwell Gas Drive powers this typical intermitter

FEATURES

- **Powered by gas or air—no winding**
- **Built right into a standard Rockwell chart drive case**
- **Adapts to fit practically any instrument without cutting**
- **Uses only 4 cubic feet of gas in 24 hours**
- **Operating pressure range 15-25 psi**

withstood Hurricane "Flossy"

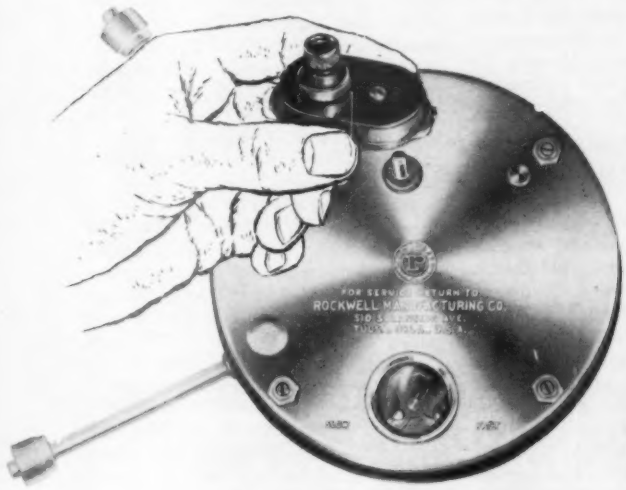
THE NEW ROCKWELL GAS DRIVE

A gas or air powered chart drive for all kinds of recording instruments—completely self-contained, self-starting.

Let's hope you will never need a chart drive that will run throughout a hurricane, but right now you can use the new Rockwell Gas Drive with profit to power remotely located instruments. You can forget the costly chore of periodic winding, for this drive is completely self-powered by the gas (or air) in the flowing stream.

The Rockwell Gas Drive is economical to run—it consumes only 4 cubic feet of gas every day. It's safe, too, for there is no venting problem. And it is built right into the case of a standard Rockwell chart drive and has all the interchangeability features of the spring wound design. It can be neatly fitted into practically any make intermitter, production timing instrument or recorder by using furnished adaptors for position and height. Speed changing turrets, which snap on to the main arbor, provide the utmost versatility in rotation rates. So with a stock of standard Rockwell Gas Drives, plus a selection of economical turrets, you can serve all your instrument needs.

Get full facts by writing Rockwell Manufacturing Company, Instrument Division, Pittsburgh 8, Pa.



The turret on top does the trick.

See how easy it is to convert a Rockwell Gas Drive to any of 10 different rotation rates.

The main arbor on this drive rotates once every 24 hours. Speed changing turrets are available to give 2-hour, 3-hour, 4-hour, 6-hour, 12-hour, 48-hour, 72-hour, 7-day, and 8-day rotation. No special tools or skills are required to convert to different rotation rates; the turrets snap into place.

GAS DRIVES, CHART DRIVES

another fine product by

ROCKWELL

J&L Supply Division completes

. . . a new pump repair shop at Hobbs, N. M. Located adjacent to a J&L supply store, the shop was constructed to expand pump-repair service among oil producers in West Texas and eastern New Mexico.

Reed Roller Bit Co. appoints

. . . W. H. (Buddy) Armstrong to regional sales manager for Oklahoma, Kansas, and North Texas; and names T. H. Patterson to division manager with headquarters in Oklahoma City.

The announcement comes from W. E. Scarborough, Reed's domestic sales manager. It was also announced that G. M. (Choc) Charleston had been named special salesman in Oklahoma City.

W. H. Armstrong

T. H. Patterson

Armstrong, former division manager in Oklahoma City, will locate in Tulsa. Patterson has been in the rotary drilling-tool sales field for 11 years, and Charleston has been selling rotary-drilling tools for 9 years.

Collier-Hile Co. is acquired

. . . by C. Jim Stewart & Stevenson, Inc. As a result of the purchase, C. Jim Stewart & Stevenson becomes exclusive distributor of the Hyster line of industrial trucks and material-handling equipment for the south half of Texas.

Hyster trucks will be handled by the company's Truck Lease Division, under the management of George Felts and Bill Herring.

Calvin D. Sholtess assumes job

. . . of division sales manager for Hughes Tool Co., with headquarters in Bakersfield, Calif. W. H. Siems, general sales manager, made the announcement.

Sholtess joined Hughes as a junior field salesman in 1950. He since has been assigned to field, division, and regional engineering posts in Oklahoma, Kansas, and the Rocky Mountain area. Prior to this promotion, he was regional sales coordinator at Denver.

Other personnel changes announced by Siems include the promotion of Thomas E. Dobbins to regional sales coordinator at Denver; Leonard G. Parrott to regional sales coordinator at Dallas; M. Gordon Clarke to regional special sales representative at Dallas; and Dean L. Leyerly and Floyd E. Van Hook, to division special representative at Farmington, N. M., and Oklahoma City, respectively.

Siems also said that Julien Muller is now regional special sales representative with headquarters in Los Angeles.

G. D. (Duane) Wiley transferred

. . . temporarily to McCullough Tool Co.'s service location at Williston, N. D. Wiley, assistant division manager, sales promotion, was formerly stationed at Denver. His transfer is to provide added service to the oil industry in the Williston basin and surrounding areas.

Vogel made sales representative

. . . for Mission Mfg. Co.'s northeast district with headquarters in Philadelphia. He will be responsible primarily for sales of the Hammerdril, an exclusive Mission pneumatic tool. Charles A. Vogel was sales engineer for Giles & Ransome, Inc., in Philadelphia from 1946 until 1951. After returning from service in 1953, he was a sales engineer for Frantz Equipment Co., also in Philadelphia. From 1956 until joining Mission, he was district manager and representative for M-R-S Mfg. Co., Flora, Miss.

Rubber Applicators creates

. . . the new position of sales manager, and appoints Marvin N. Reichle to fill it. In the announcement, Cordell Garner, vice president in charge of sales for the firm, noted that the move was part of a company expansion program.

M. N. Reichle

Rubber Applicators, Inc., applies natural and synthetic sheet-rubber linings to tanks, tank cars, and other equipment carrying corrosive and abrasive fluids.

Western Supply Co. opens store

. . . In Odessa, Tex., and appoints W. R. Carnes division manager of

W. R. Carnes

W. A. Williams

West Texas, and W. A. Williams manager of the new store. The report comes from Earl Coulter, vice president of supply sales.

Carnes had been employed by Wilson Supply Co. for the past 7 years. His experience includes store sales, store managing, and district sales. Williams was formerly district manager for Murray-Brooks, Inc., in the West Texas area. He is a veteran of over 22 years in oil-field supply with that firm.

George C. Jennings is named

. . . wire-rope sales manager of Colorado Fuel & Iron Corp., according to F. S. Jones, CF&I vice president in charge of sales. Jennings, who was formerly New York district sales manager, joined the company in 1946 as Buffalo district wire-rope sales correspondent for CF&I's Wickwire Spencer Steel Division.

In 1947 he was named Buffalo district salesman for wire rope and structural, and mechanical specialties. Six years later, Jennings was appointed assistant manager of the Buffalo district office. From 1956 until his appointment as New York district sales manager in 1957, he also served as special representative in the sale of galvanized-steel strand for CF&I's Eastern Division.

Jennings now will be located at the company's Palmer, Mass., plant. He succeeds A. S. Rairden, who has been named works manager at Palmer. Before beginning with CF&I, Jennings worked for Bethlehem Steel Co. and Allied Chemical Co.

Taylor, Lutke are named

. . . to new posts in the oil and gas equipment sales operations of Graver Tank & Mfg. Co., a division of Union Tank Car Co., according to General Sales Manager Henry J. D'Aragon.

James S. Taylor becomes a sales engineer operating out of Tulsa, and

It's Not A Grief Stem

IF IT'S A BAASH-ROSS KELLY

Choice of
Square or Hexagonal Kelly...

"TRUBORE" UPSET SQUARE KELLYS

From alloy steel selection to anti-gall treatment each manufacturing step is quality controlled to assure long kelly life. Because of their heavy walls, "Trubore" kellys have very little flexibility. Therefore, the joint alignment is held to unusually close tolerances to eliminate risk of "working" at the joints, thus minimizing joint failures. Added length at top and bottom upsets allows recutting threads for added life.

B-R square kellys are made in various styles including the plain type. Special lengths, cross sectional dimensions or upset designs using any type of steel are available on order.

"TRUBORE" HEX KELLYS

Because this kelly can be used without change for both regular or pressure drilling it is widely used as the standard for all drilling operations.

The Baash-Ross hex kelly has these advantages:

- Smoother running (machined to shape)
- Greater resistance to bending*
- More circulation area*
- Stronger in torque*
- Greater tensile strength*

*Based on comparable square and hex kellys.

Facilities are available in the United States for reconditioning worn hex or square kellys, and for stubbing by the Baash-Ross pressure weld method.

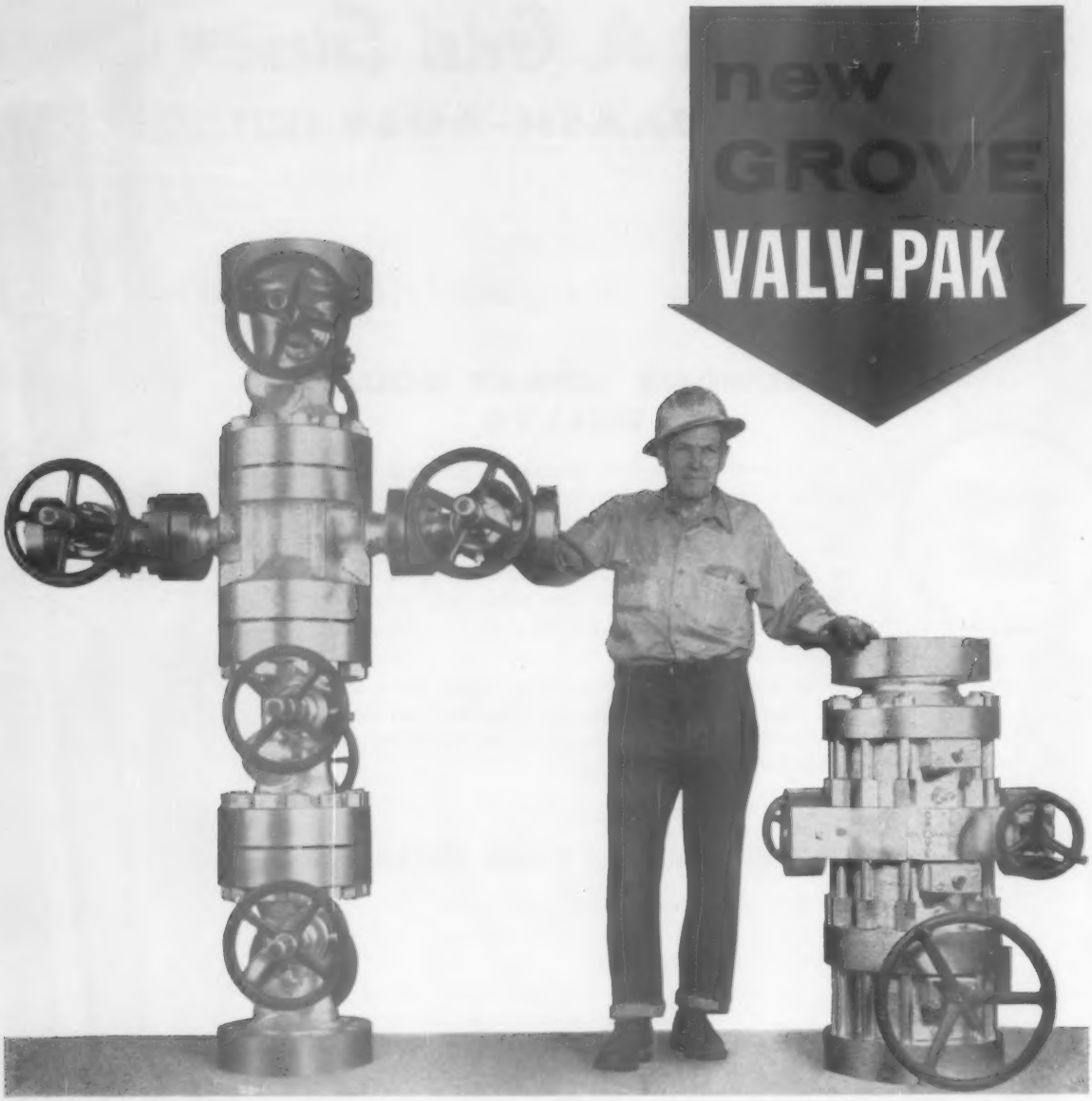
PROTECT your kelly investment — use Baash-Ross Kelly Drive Bushings.

BAASH-ROSS DIVISION
OF JOY MANUFACTURING COMPANY
GENERAL OFFICES: 5306 CLINTON DRIVE, HOUSTON, TEXAS

AREA OFFICES:
Houston, Texas, Odessa, Texas, Dallas, Texas; Long Beach, Cal.; Casper, Wyoming; Oklahoma City, Okla.; Olney, Ill.; Calgary, Alberta, Canada; New York, N. Y.

FOREIGN OFFICES:
Monte Carlo, Monaco; Mexico City, Mexico; Greenock, Scotland; London, England; Paris, France; Caracas, Venezuela; Buenos Aires, Argentina; Rio de Janeiro, Brazil; Tokyo, Japan

BAASH ROSS JOY



A MAJOR ACHIEVEMENT IN COMPACT, VERSATILE CHRISTMAS TREE VALVE ASSEMBLIES

Maximum Flexibility!—Only Grove Valv-Pak design permits field rearrangement of valves as your well characteristics change. Individual components that must be replaced due to erosion or corrosion can be changed in the field, eliminating replacement of the whole tree, as is necessary in multiple combination units.

Compact!—Amazing vertical and horizontal compactness and lighter weight make Grove Valv-Pak handier, faster and easier to install than conventional units.

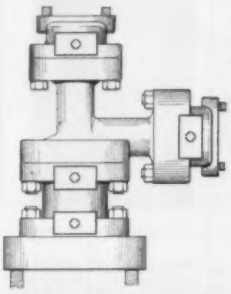
"Right Now" Delivery on Custom Units—Grove's unique design permits rapid assembly of custom units to meet your critical completion schedules on time.

VALV-PAK Tree Assemblies to meet every Completion Program

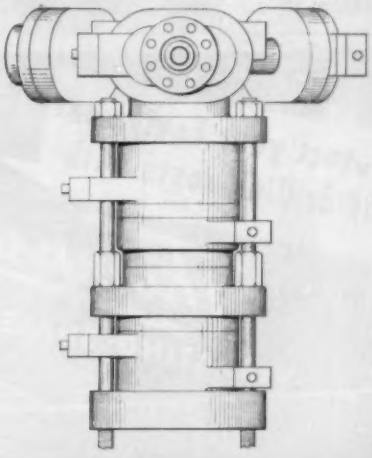
Sizes and Types

Valv-Pak may be furnished in all ranges, types, sizes and end connections presently used. Bore sizes: 1½ through 4"; working pressures: 2,000# psi to 10,000# psi. Flange connections and bore seals can be supplied to meet any Christmas Tree manufacturer's specifications.

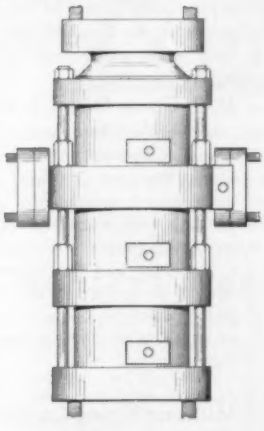
Single Completion



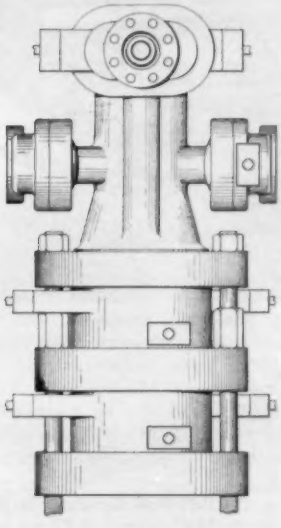
Triple Completion



Dual Completion



Quadruple Completion



GROVE VALVE and REGULATOR COMPANY

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In Western Canada: GROVE VALVE LTD., EDMONTON

Wayne Lutke takes over as district manager operating out of Midland, Tex.

Collins Radio Co. names two

. . . microwave sales representatives for the company's Texas Division. Donald F. Snyder will serve the Rocky Mountain states with offices in Denver, and Robert M. Millner will serve the North Central states. He will locate at Minneapolis.

The two men came from North Electric Co.—Snyder being North's sales manager, and Millner a regional sales manager.

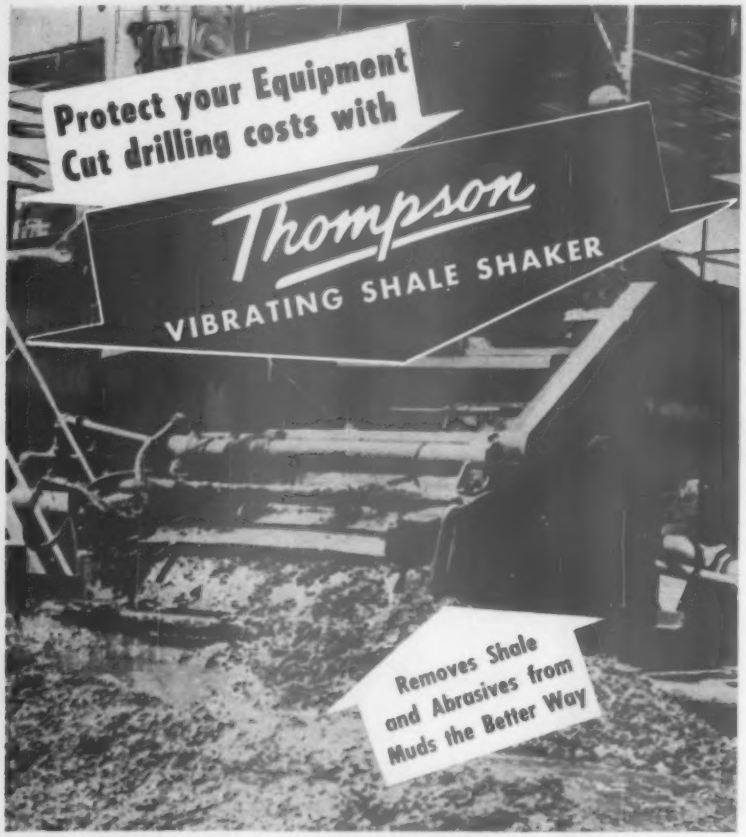
J. W. Brand named vice prexy

. . . of M. J. Crose Mfg. Co., Inc., manufacturer of pipeline construction equipment. He will locate at the firm's main offices and plant in Tulsa.

J. W. Brand

Clare G. Miller, Crose president, made the announcement. He said that Brand, also vice president of Crose-Curran, Ltd., will continue to spend considerable time in Canada, directing operations of the Crose subsidiary company from its headquarters in Edmonton, Alta. Crose-Curran, Ltd., is the Canadian distributor for the parent Crose company.

Brand joined Crose in 1953 as a sales engineer and was appointed vice president of Crose-Curran in 1957. Prior to joining the company, he had been a field representative for Williams Brothers Co., and also general manager of Brand Dispatching Co. in New Orleans.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VIBRATING SHALE SHAKER
Removes Shale and Abrasives from Muds the Better Way

Separation of shale and abrasives from drilling muds is an important *must* for an effective, time-conserving, money-saving drilling job. Reclamation of mud is vitally important. No matter what the mud flow or well depth may be, a THOMPSON Vibrating Shale Separator and Sample Machine stands up to meet any demand. It's field proven! *You get clean mud.* THOMPSON Separators are self-motivated . . . making tools last longer . . . with a minimum of re-tooling and restoration of mud solution.

A THOMPSON Separator is your surest bet . . . for shallow, medium and deep wells. The dependable Sample Machine works simultaneously with the Separator, giving a foot-by-foot mud analysis with specimens. *Write for Free Folder.*

THOMPSON TOOL CO.
IOWA PARK, TEXAS

SOLD ONLY THROUGH SUPPLY STORES

Oklahoma City firm promotes

. . . two employes, according to W. R. (Bert) Wheeler, Jr., vice president of American Iron & Machine Works Co.

Haskell (Inky) Wotkyns has been appointed division manager in a territory that includes East Texas, the Texas Gulf Coast, Louisiana, California, and Mexico. He will locate in Houston. Wotkyns was formerly headquartered in Tulsa as a special representative for American Iron.

Haskell Wotkyns

Guy Tucker

Guy Tucker has been made division manager for the Rocky Mountain and Canadian area. He will continue to headquarter in Denver, where he previously served as district manager. Tucker has been with American Iron for 9 years and was formerly district manager in Canada and Illinois before going to Denver.

M. J. Crose Mfg. Co. acquires

. . . Perrault Equipment Co., Inc., of Tulsa. Clare G. Miller, president of Crose the past 2 years, said the Perrault plant, which has some 50 employes, will continue manufacturing as in the past.

Perrault had been owned and operated by its president, W. O. Dixon. Miller said he knew of no immediate changes in the operations of Crose or Perrault.

Midwest Piping Co., Inc. names

. . . Oil Well Supply Division, U. S. Steel Corp., as distributor for welding fittings and flanges for petroleum pipelines and refinery piping systems. The announcement comes from Phil R. Becker, Midwest's director of manufacturing sales.

With main offices in Dallas, Oil

DIRECT

PIPELINE TO THE WORLD'S OIL CENTERS

CARGO OR PASSENGER, IT'S KLM "THE OILMAN'S AIRLINE!"

FROM HOUSTON: direct to Europe, Africa, the Near, Middle and Far East. FROM MIAMI: direct to South America. Daily service. FROM MONTREAL: direct to Europe, Africa, the Near, Middle and Far East. FROM NEW YORK: direct to all Europe and beyond; also to Curacao, Aruba and South America. IMPORTANT: Your cargo receives rapid ground handling. Awkward shapes easily accommodated. FOR PASSENGER SERVICE: Call your Travel Agent or KLM office. For cargo service: Contact your Cargo Agent, Forwarder or KLM office.

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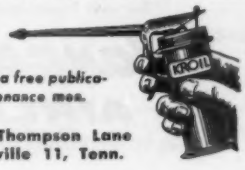
Don't spoil it- KROIL it!

Don't ruin a valuable piece of equipment merely because some part is rusted tight. Apply *KROIL*, the amazing new chemical lubricant that creeps into millionth inch spaces (proved by laboratory tests), **dissolves rust, supplies necessary lubrication and . . .**

Loosens Frozen Parts

18,000 of America's leading plants can't be wrong. They have used KROIL for ten years and depend on it to save expensive labor and valuable parts. They say: "Kroil loosened bushings after a 12-ton press had failed" . . . "on repairing heat treat trolleys formerly destroyed every nut. Now Kroil saves them all, and time, too."

You too can get these results. Try KROIL on money-back basis. Gallon, $4.00; with Kroiler squirt gun, $4.95, f. o. b. factory.



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KANO LABS. 1039 Thompson Lane Nashville 11, Tenn.

NOW TITRATIONS by AUTOMATION !

Make titrations a routine function for lab assistants! Cenco's new Color-Matic End-point Detector and Volumatic Syringe enable quick, successive determinations — just *push a button and read a number.* Eliminates human element and drainage errors. Precise to within a few parts per thousand. Write for Bulletin 285.

No. 20925 Color-Matic Endpoint Detector $395.00
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no more knuckle-busting...
New RIDGID 450
Portable Tristand Chain Vise

has Large, Easy-to-Operate
Top Screw Handle
right up on top!

Here's a real time saver. Not only do you get a complete workbench that's truly portable, but now you get a chain vise that's extra easy and fast to operate. Handle is right up on top where it's always handy. Handle and tightening nut are anchored to vise base . . . can't pull out.

Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

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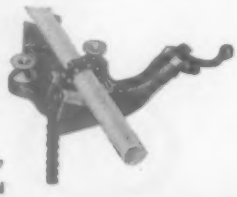
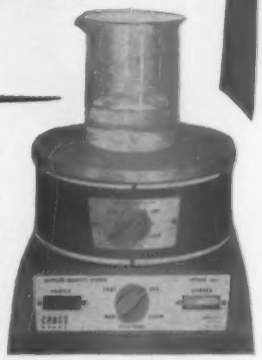
have same Extra-Efficient Top-Screw Adjustment.



5 Sizes for ⅛" to 8" Pipe, Conduit or Rod

The Ridge Tool Company, Elyria, Ohio, U.S.A.

HEAT and STIR!
new CENCO Hotplate Magnetic Stirrer



Combines an electric hotplate and magnetic stirrer which operate independently or simultaneously. Variable speed stirring is powerful enough to stir beaker of pure glycerin. Heat control by adjustable thermostat. Top plate 7¾" of cast aluminum. No. 16632 for 115 volt operation, low priced at . . $64.50

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All flights to Mexico City are your link to Canadian Pacific's famous South American service. Canadian Pacific is your finest flight to Lima, Santiago and Buenos Aires. You'll enjoy the matchless hospitality of Canadian Pacific's

International service. Stretch-out arm chair seats, friendly atmosphere and relaxing, air-conditioned comfort. Canadian Pacific service continues with exquisite vintage wines and superb continental meals. Be one of the millions who know that Canadian Pacific's hospitality cannot be matched throughout the world.
Plan your business travel for pleasure . . . from Mexico City it's non-stop to Lima, Santiago and Buenos Aires.

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WINGS OF THE WORLD'S GREATEST TRAVEL SYSTEM

Well Supply maintains 30 sales offices and 90 warehouses throughout the United States. Midwest operates two manufacturing plants in St. Louis, two in Houston, and one each in Clifton, N. J., and Los Angeles.

George J. Greaney, Jr. becomes

... Houston district manager for Elliott Co., Jeannette, Pa., succeeding J. D. Willcox, Jr., new southern region manager.

Greaney joined Elliott 12 years ago and was made a field engineer in the Houston office after a year's training. From 1952 to 1954, he was manager of the Corpus Christi office, after which he returned to Houston.

C-B Southern adds to staff

H. L. Jackson

...to meet the demand for gas compressors packaged at its new Houston facility.

Harry L. Jackson, former technical service manager and assistant chief engineer at Union Tank Division of Butler Mfg. Co., joins the staff as a development engineer. Richard L. Flowers and George H.

R. L. Flowers

G. H. Haltom

Haltom are new members of C-B Southern, Inc.'s sales-engineering staff.

Flowers was formerly division equipment engineer of Phillips Petroleum Co. Haltom was manager of machinery sales for Houston Oil Field Material Co. for the past 14 years.

Chicago engineering office set up

... by Thompson-Ramo-Wooldridge Products Co., Raymond E. Jacobson, director of marketing, announces. Ray J. Stanish, central-regional sales manager, will head the office and will be responsible for all sales activities in the Central United States.

Stanish was chief engineer of the replacement division of Thompson Products, Inc., in Cleveland prior to joining TRW Products last year. Thompson products and Ramo-Wooldridge Corp. merged in 1958 forming Thompson-Ramo-Wooldridge, Inc., of which TRW Products is a division.

Lawrence B. Hume is elevated

L. B. Hume

...to assistant manager of power-engine sales by Cooper-Bessemer Corp., reports Grant C. Woodard, general sales manager of the Mount Vernon, Ohio, concern. In his new post, Hume will work under R. Spetka at the Mount Vernon main office.

In this capacity, he will be responsible for the application and sale of gas, diesel, and gas-diesel engines.

Hume, who began with Cooper-Bessemer in 1940, had been with the corporation's Washington, D. C., sales office.

American Cyanamid Co. makes

... a change in its Industrial Chemicals Division, reports G. W. Russell, division general manager.

James Boyd Smith has been named manager of sales development for refinery chemicals. He joined Cyanamid in 1955 as market analyst in the company's New York office, and has served as a sales representative in the refinery chemicals department's Houston office.

ALL OVER THE WORLD

ROLLS-ROYCE

DIESEL ENGINES

SALES DOUBLED IN TWELVE MONTHS

ROLLS-ROYCE Diesels

ROLLS-ROYCE LIMITED · OIL ENGINE DIVISION · SHREWSBURY, ENGLAND

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ROLLS-ROYCE — AERO ENGINES · MOTOR CARS · DIESEL AND PETROL ENGINES · ROCKET MOTORS · NUCLEAR PROPULSION

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WASHPIPES
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Engineered to work together for less friction, longer life, greatest economy!

AT SUPPLY STORES EVERYWHERE

DRILLING EQUIPMENT MANUFACTURING CO.
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COMBINATION
PREHEATER AND
HEATED CENTRIFUGE

Winter is Coming!

This new low-cost machine is the only economical device to make possible accurate B. S. & W. tests regardless of weather. Heat loss during test is negligible, even in coldest climate. Available 6 or 12 volt, for either 12.5 ml or 100 ml test tubes. Write for information and prices.

"Everything the Gauger needs from one dependable source."

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Phone: Diamond 3-8241
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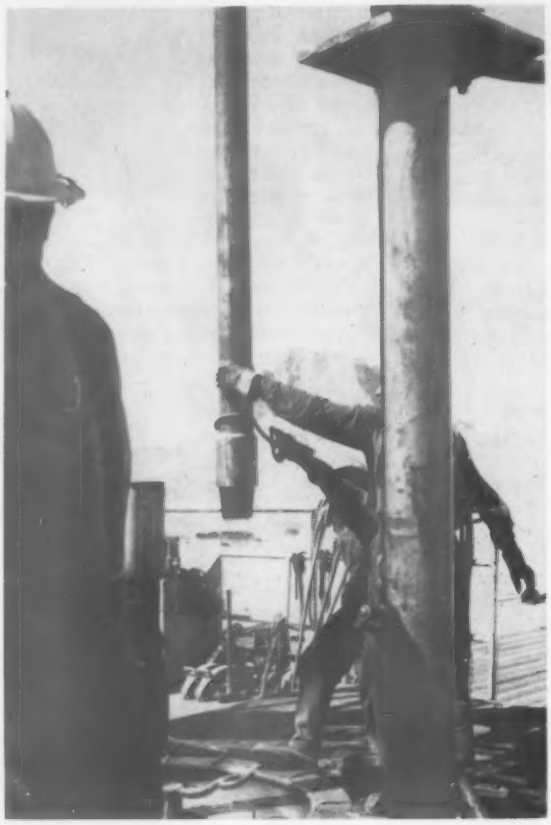


Varied terrain presents

Drilling headaches in Iran

AN International Drilling Co. crew is busy drilling in the mountainous area of southern Iran where development work is under way in Gach Saran field.

Three rigs are running in the field, which is being developed by Iranian Oil Exploration & Producing Co., the operating company for the international consortium holding the concession in the southern sector of Iran.

Both Gach Saran's terrain and geology presents drilling problems. A flat area for a drilling location is virtually unknown and moving a rig from one site to another means going up and down as much as forward. Drilling engineers are faced with thrusts, sharp folds, and faults common in Gach Saran.

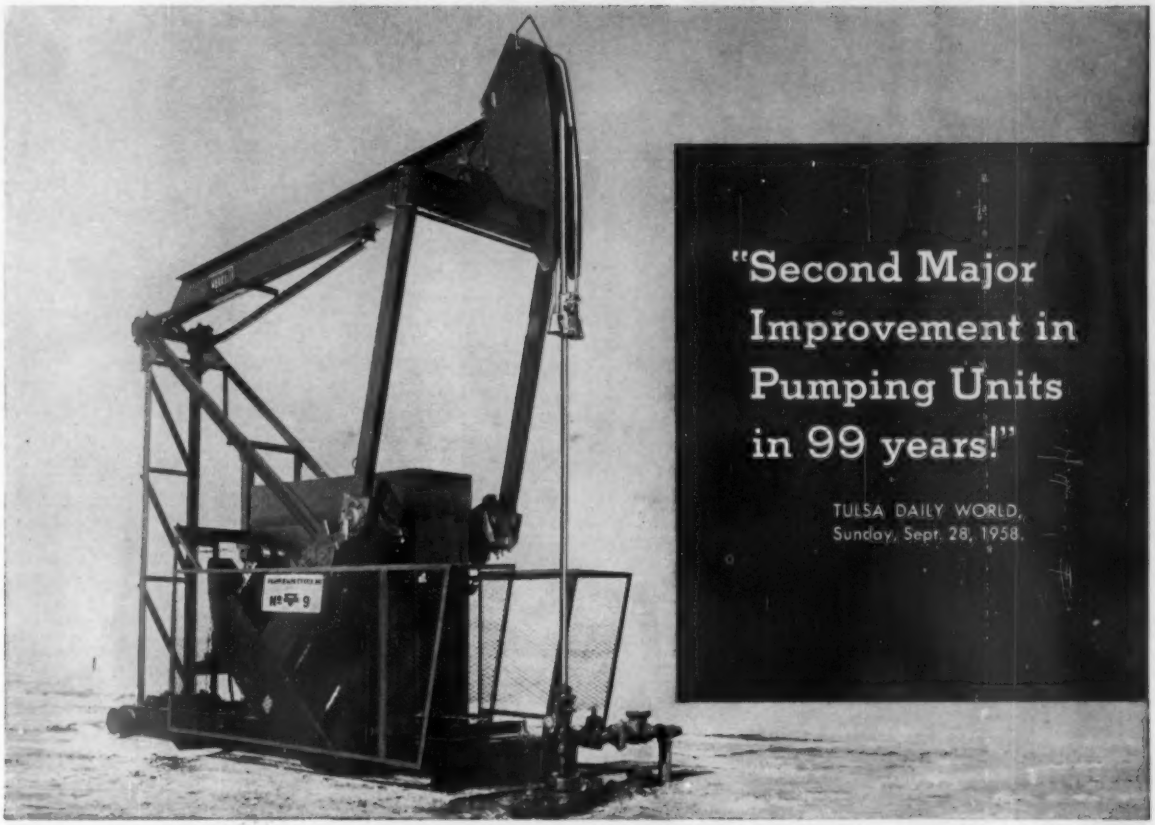
Things looking up for Down-Under contractor

AN AUSTRALIAN company, managed by a Canadian and basing its operations on American methods and organization will soon celebrate five successful years as a drilling contractor.

On November 6, 1954, in the northern Australia state of Queensland, Oil Drilling & Exploration, Ltd., spudded in its first well for its first customer. Since that date it has drilled 42 wells with a total depth of 170,000 ft.

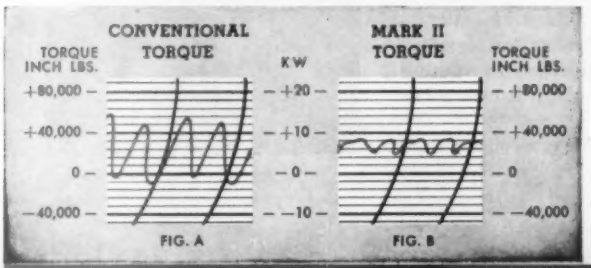
ODE's largest customer is West Australian Petroleum in which the major shareholders are Caltex and Shell. All West Australian Petroleum's deep-hole drilling has been done by ODE since 1956.

The list of the company's clients also includes Timor Oil, Longreach Oil, Australian Oil & Gas, Frome-Lakes (Stanvac-BP), Associated Freney, South Pacific, Zinc Corp., Frome Broken Hill, and the Aus-



How the Mark II Unit Pumper
CUTS PUMPING COSTS 20% and more

UNITORQUE is an exclusive advantage of the MARK II Unit Pumper that effects a more uniform torque demand and reduces peak torque requirements as much as 40%. This is brought about through a unique geometric arrangement and a phased counterbalance. Figures A and B show watt meter charts on turnabout comparison tests between a conventional pumper and a Mark II, pumping the same well under identical conditions. Figure A indicates that the conventional unit required a peak load of 14 KW, equivalent to 56,000 inch-pounds of torque. Figure B shows that the Mark II required only 9 KW at peak load, equivalent to 34,000 inch-pounds of torque, pumping the same well with the same motor. This adds up to a substantial reduction in peak torque that the reducer must deliver in order to lift a given load at the polished rod. The result is a major savings in speed reducer size, prime mover cost and in the cost of power.



Quick, Easy, Semi-automatic Counterbalancing — For the first time in the history of the industry, the pumper can, by simply moving a lever forward or backward, employ the unit's energy of rotation to reposition a portion of the counterweight. By this effortless adjustment of the counterweight to meet varying well load conditions, it is possible to eliminate "ninety percent"* of the mechanical failures of gears, pitmans, belts, bearings and shafts. Savings from the resulting reduced maintenance costs can be substantial.

*Sucker Rod Handbook No. 336, Page 169.

FOR COMPLETE INFORMATION about the MARK II Unit Pumper, write for descriptive literature.

OILFIELD EQUIPMENT CORPORATION OF COLORADO
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EC

Standard Oil Company of California, Rig LAI #173, Inglewood.

Servco Pilot Mill mills up 170′ of 5½″, 15.5#, J55 casing in 16 hours, 50 minutes!

In this Standard string, two separate sections of 7″, J55 casing, totalling 170′, were swaged to 5½″, 15.5# and run opposite independent producing zones. After cementing and testing, the swaged areas were milled out with one 6½″ Servco Pilot Mill in 16 hours, 50 minutes!

Prior to development of Servcoloy*, costly, slow-milling aluminum alloy casing would have been used in the reduced sections. Substituting steel casing resulted in important savings both in casing costs and rig time.

Use Servcoloy on your next milling job. Cutting rates possible with this unique milling material can't be matched. Your nearest Servco office will give you the full story.

*U.S. PAT. NO. 2,833,638

Steel shavings taken from the shaker prove Servcoloy efficiency.

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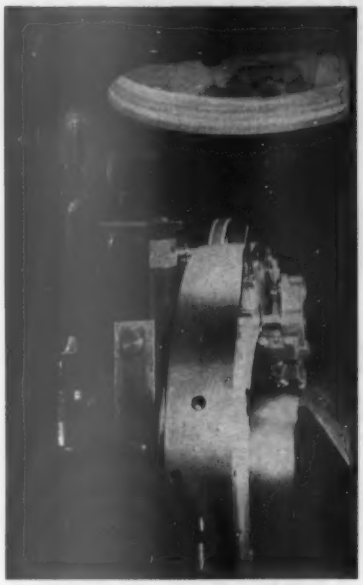

. . . Refinish Crank-Pins . . . In Place!

● Accurate High Quality Maintenance And Machine Work

The small engine crank pictured above was restored in close quarters without dismantling engine. Our portable machines can solve your problems and save you money. Crank pins from 5½" through 20" in diameter accurately refinished in place at great saving in cost. **Let us help you minimize down time.**

Worn and damaged flywheel fits refinished in place.

In our shop crankshafts of any size or type completely refinished. Shafts straightened and broken shafts successfully repaired.

Most modern methods used in rebabbitting and machining engine and turbine bearings.

All types of heavy power plant equipment serviced with special attention given to emergency repairs.

Additional information furnished without obligation.

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SHERMAN, TEXAS
Established 1876
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tralian Commonwealth's Bureau of Mineral Resources.

Except for minor changes dictated by geography, ODE operates on the American pattern and uses American equipment. It owns three drilling rigs: a National T20, a National 55, and a National 80B. These rigs are capable of drilling from 3,000 to 12,000 ft. A subsidiary, Oilfield Supply, furnishes the industry with supplies for drilling rigs and oil-field drilling. Geological Investigations, another subsidiary, provides testing services.

According to Managing Director, J. G. Antliff, a Canadian: "We started the company 5 years ago because we recognized that there was a lack of American-type oil-drilling facilities in Australia and Southeast Asia. A demand was felt for rotary-drilling equipment by prospecting companies. Otherwise they would be faced with long delays and heavy expenditures involved in sending plants and technicians all the way from the United States."

Australian ingenuity cuts rig down time

American contractors are accustomed to well-stocked supply stores and extensive fast transportation networks. Australian operators aren't so lucky. Look at the emergency engineering job one firm accomplished.

At the Delhi-Santos site at Innamincka in South Australia, Delhi Australia, Ltd., drilled to 7,464 ft. and was coming out of the hole. They dropped three rock-bit cones. Faced with a fishing job without the proper tools, time was critical as the hole might be lost.

Hurryup calls to existing supply sources revealed that no suitable tool was available to separate the hard cones. A. R. Gibson, petroleum engineer for Delhi said that Horwood Bagshaw, Ltd., was contacted to make a specially designed tapered, fluted mill to separate the cones. Meanwhile, a magnetic tool adapted to fit a junk basket was brought in by charter plane from Derby, W. A.

The cones were separated, retrieved, and drilling was resumed within 72 hours after the tools arrived on location. Not only was the hole saved but idle-time costs were minimized.

Jack Perry, chief for Horwood Bagshaw, said that quick service in making the special tool was due to his plant having a combination of heavy forging and modern machine-shop facilities. The company had acquired a new oil-country lathe with a 10½-in. hollow mandle specially suited for screwing the precisely tapered threads.

SPECIFY 500 TON for LONGER THREAD LIFE!

Protects more tool joint threads than any other compound!

Sold ONLY through supply stores

MONEY BACK GUARANTEE

USE JIMMIE GRAY DOPE BRUSHES

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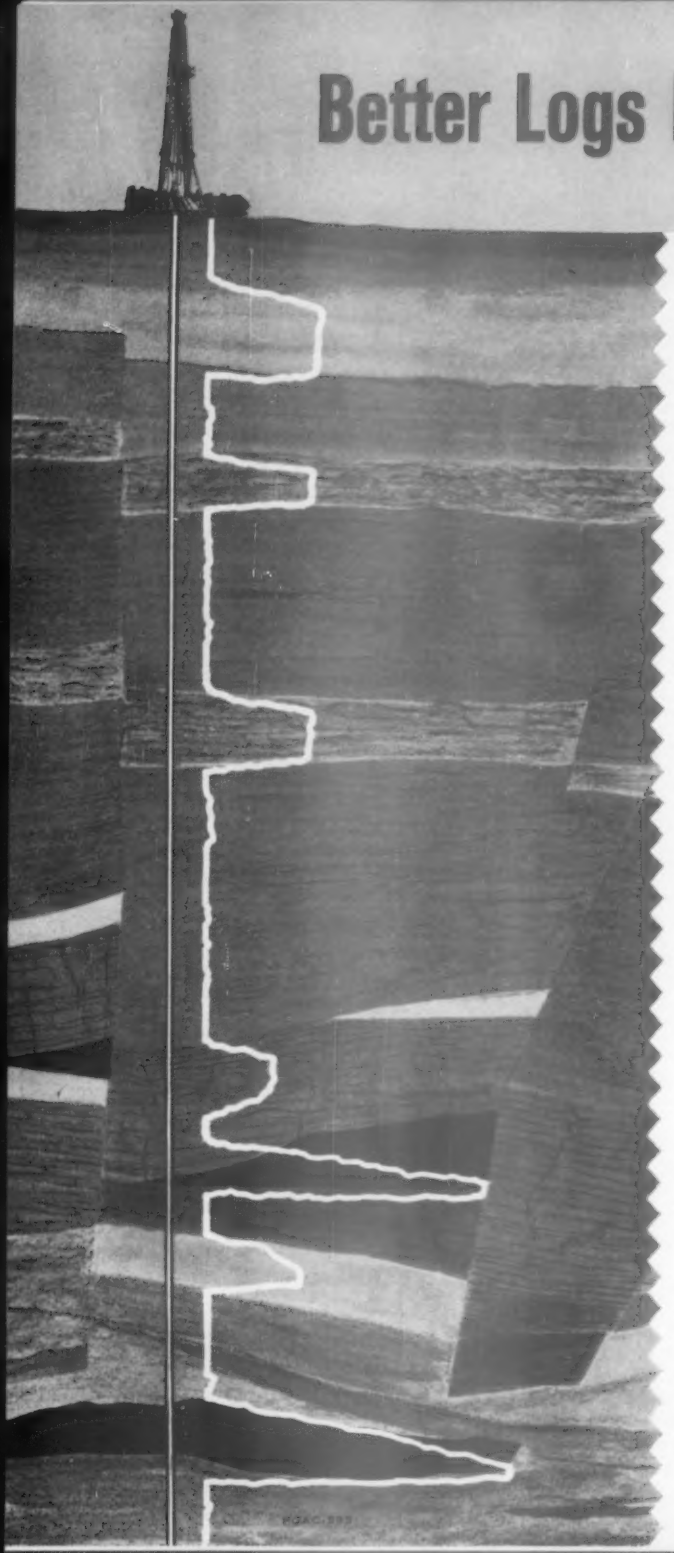
Better Logs Make Better Wells...



PGAC

Serves You With LOGS of EVERY TYPE —Proven BETTER In Toughest Wells

Five-Curve Electrical Logging
Combination Induction/Electrical Logging
Micro-Caliper Surveying
Laterologging and Microlaterologging
Caliper and Directional Surveys
Continuous Dipmeter Surveying
Continuous Velocity Logging
Velocity Log and Seismic Calibration
Temperature Surveying
Sidewall Sample Coring
Strata-Test Fluid Sampling
Simultaneous Nuclear Logging
Gamma-Ray and Depth Control Logging
Neutron/Neutron Logging
Spectral Chlorine-Detection Logging
Through-Tubing Nuclear Logging
Radioactive Tracer Service

When you call PGAC you get Better Performance — Better Results

PGAC OIL FIELD SERVICES

Pan Geo Atlas Corp.

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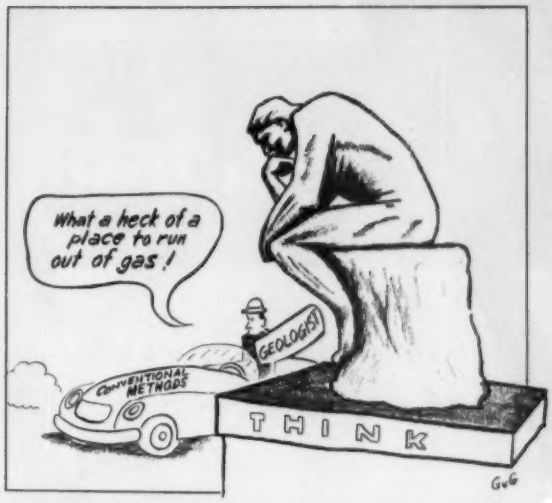
CHEMETRON

FORMERLY: PERFORATING GUNS ATLAS CORPORATION

PGAC's SUBSIDIARY COMPANIES — CANADA — Perforating Guns of Canada, Ltd. VENEZUELA and BOLIVIA — Servicios Tecnicos Atlas, C.A. GERMANY — Atlas Deutsch-Amerikanische Ölfelddienst, G.m.b.H. U.S.A. — PGAC Development Company

BY FRANK J. GARDNER

The dearth of new ideas and new approaches in the oil-finding world poses a question:



THE WYOMING Geological Association poked fun at itself with this cartoon in a recent issue of its Newsletter. WGA member Gunther von Gotsche used his pen to prod a tender spot when he reminded western oil finders of a basic need for thought.

What's happened to our thinkers?

THIS PAST SUMMER, the exploration pages of the Journal carried a number of "methods" papers—summaries of new and different approaches to oil finding.

The reactions of readers were, as expected, mixed. Some were acidly critical, some praiseful, some questioning. The questioners we considered the most important, for our sole purpose in presenting the articles was to make the reader **think.**

Thinkers arise . . . Some of the methods were offbeat. Some weren't. But they'd all been tried in the field, all had some kind of scientific approach, and all came from oil hunters who claimed some kind of success. Most important, the authors of the articles were thinkers who weren't afraid to stand up and be heard. For it's precisely this breed who will eventually present us with improved ways of finding oil and gas.

This fall, a lot of thinkers are going to stand up and be heard. They started last week in Lubbock. They'll do it again in Wichita. And in Houston. In short, it's convention time.

Scanning the programs of these meetings, one is struck by two things: a swing toward down-to-earth titles, and a complete absence of methods papers.

In Lubbock last week, the Southwestern Federation of Geological Societies heard Dr. W. C. Bell of The University of Texas make a telling attack on institutionalized geologic thinking under the title "Telling Time by Tape and Type Section." Dr. Sam Ellison, of the same school, asked his audience, "Why Not Make Paleontology Understandable?"

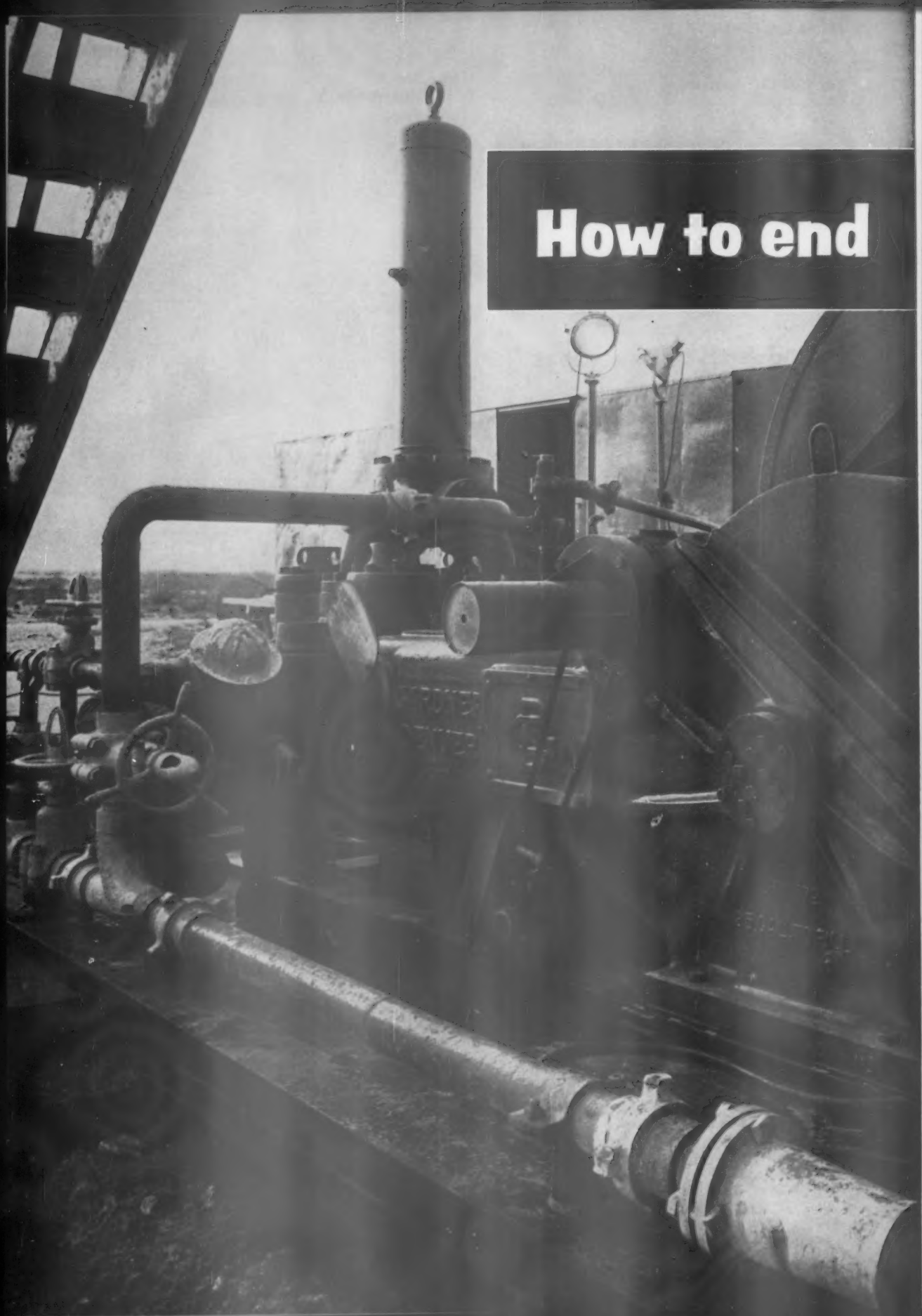
In Wichita, on October 28-30, the Mid-Continent Section of the AAPG will hear Lewis G. Weeks, AAPG president, give his views on "Energy in 2059." Two papers that represent advances in subsurface methods will be given here; these are Daniel A. Busch's thought-provoking "Prospecting for Stratigraphic Traps," and John Grayson's "Application of Palynology to Geology."

Houston will play host to the Gulf Coast Association of Geological Societies on November 11-13. Here the program lays heavy emphasis on sedimentation. Judging from the titles, this will be a scholarly session, with new approaches limited to log-interpretation techniques.

These meetings provide a fine medium for exchange of ideas. Unfortunately, few of them make provision for question-and-answer sessions. If program chairmen were to poll the delegates, they might find a preference for fewer papers of greater length, each to be followed by a question period. The reaction varies in different parts of the country. But one item of universal interest is the possibility of new methods and new machines.

To defend their thoughts . . . Why so few papers on this subject? Have our thought machines literally run out of gas, as suggested in the cartoon on this page? Have we made a fair investigation of the so-called offbeat methods? Why not put the advocates of these methods on the podium and let them be heard? A question-and-answer session might reveal the bugs in their plan—or it might stimulate others to new approaches that would eliminate those bugs.

Many unconventional methods of exploration are in actual use today. Their effectiveness can only be proved by tangible results; will they be able to prove that they were directly responsible for oil in the tanks in virgin territory? If so, the impact upon the exploration field would be profound. Geology had to pass that test, and so did geophysics. The oil industry awaits the next candidate. Meanwhile, our present approaches will continue to be improved upon, for they will be sorely needed as adjuncts to any new approach.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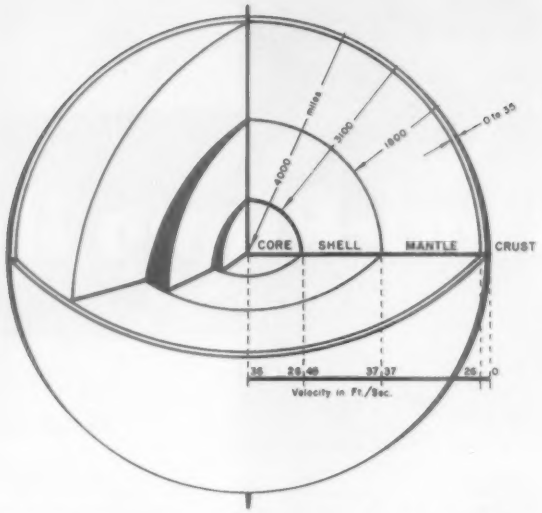
Geoacoustic spectrum



FOUR GENERAL sections of the earth shows their thickness and elastic properties. Fig. 1.

BY C. H. THURBER

IN DEALING with the acoustic characteristics of the upper crust of the earth, it is necessary to show the development of a porosity chart and the importance of logging the full spectrum of the economic section.

Some of the physical parameters to consider, starting with the earth's four general sections and their respective elastic properties, are shown in Fig. 1.

The velocities of the earth are measured by earthquake seismology, seismic prospecting and acoustic logging methods. Each method deals in similar velocity ranges but entirely different frequencies and wave lengths. The relationship of wave length, velocity, and frequency is illustrated in Figs. 2, 3, and 4 for the above three sciences. Some of the commonly measured earthquake frequencies and their respective velocities and wave lengths are seen in Fig. 2. It is seen that the frequency is in terms of seconds per cycle and the wave lengths are in hundreds of miles.

	Depth to top (miles)	Velocity range (1,000 ft. per sec.)
Core	3,100	26-36
Shell	1,800	37-45
Mantle	0-35	26-37
Crust	Surface	0.5-26

The more commonly studied seismic frequencies and their velocities and respective wave lengths are exhibited in Fig. 3. Note that the lengths are from 100 to 700 ft.

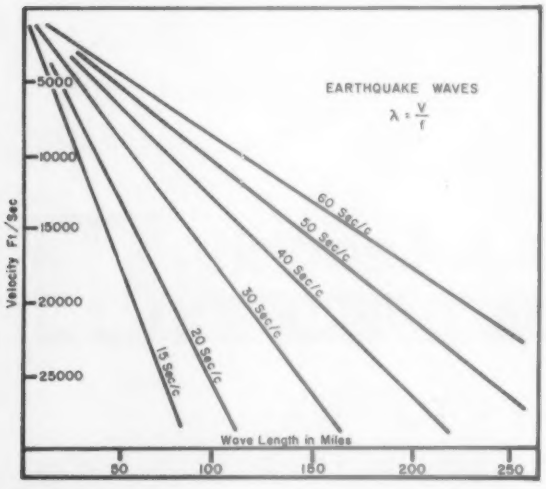
The frequency range of logging spectrum (Fig. 4) is from 10,000-20,000 cycles per seconds (c.p.s.) and the wave lengths are from 0.5-3 ft.

The above-plotted curves do not necessarily represent the maximum or minimum limits, but are used to demonstrate the general range of conditions of comparable velocities. The wide difference betwen the seismic and logging frequency and wave lengths may have some bearing on the difficulty in time tying well geophone surveys and acoustic logs.

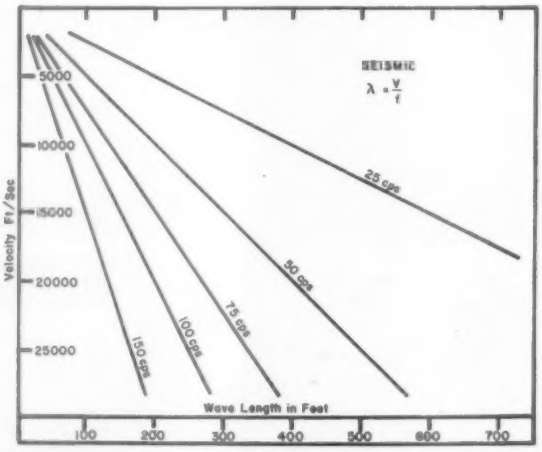
In some instances a relationship be-

About the author . . .

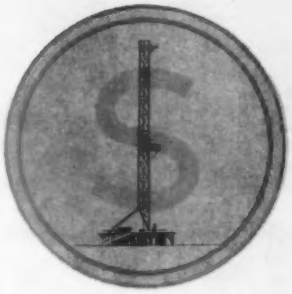
Charles H. Thurber is vice president of Empire Geophysical, Inc., Fort Worth. Following his graduation from Colorado School of Mines in 1939 as a geological engineer, he worked for Stanolind Oil & Gas Co. His wide geophysical experience includes work in the Mid-Continent, Rocky Mountain, and Gulf Coast areas. He has also worked for Plymouth Oil Co. and Continental Oil Co. before joining Empire in 1953.



SOME OF the commonly measured earthquake frequencies are given with their velocities and wave lengths. Fig. 2.



THESE ARE the more commonly studied seismic frequencies with their velocities and wave lengths. Fig. 3.



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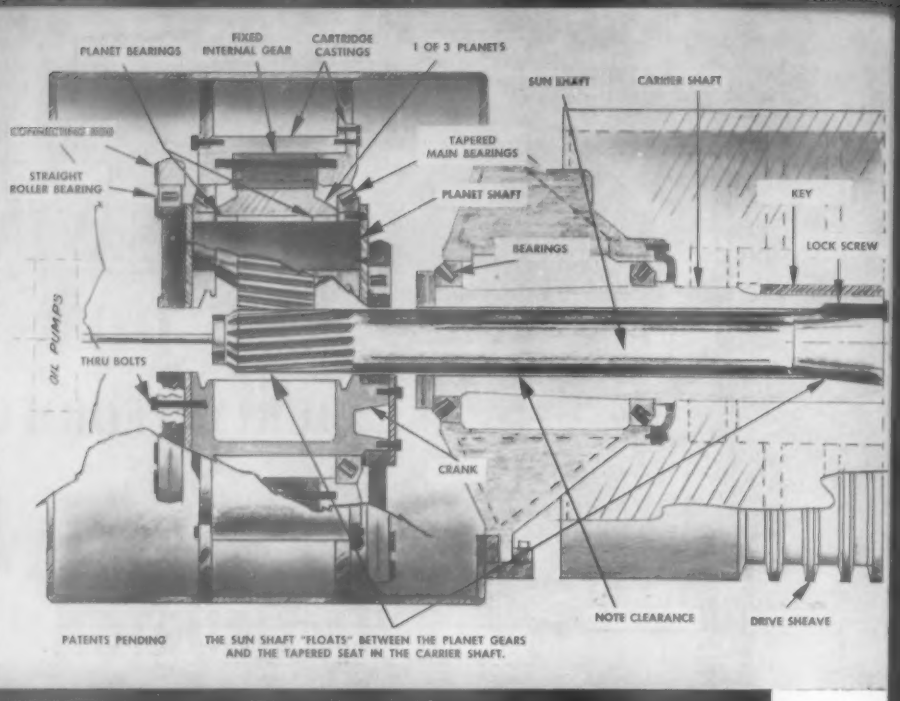

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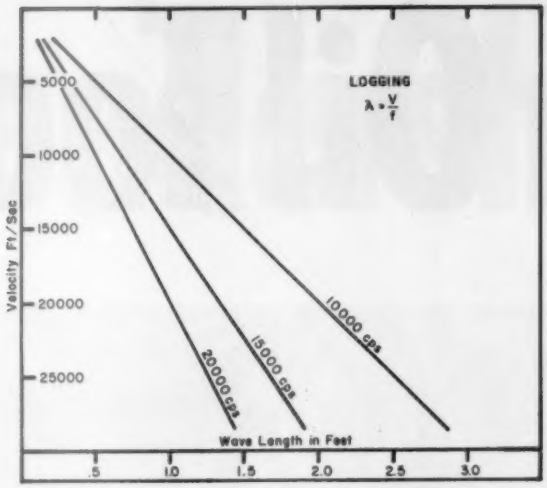
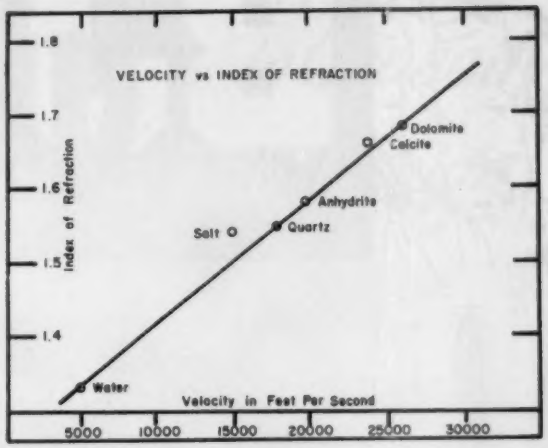


THESE ARE the frequency range and wave lengths of the logging spectrum. Fig. 4.



A RELATIONSHIP is seen between velocity and the index of refraction for some pure rocks. Fig. 5.

tween velocity and the index of refraction is possible for pure rocks (Fig. 5).

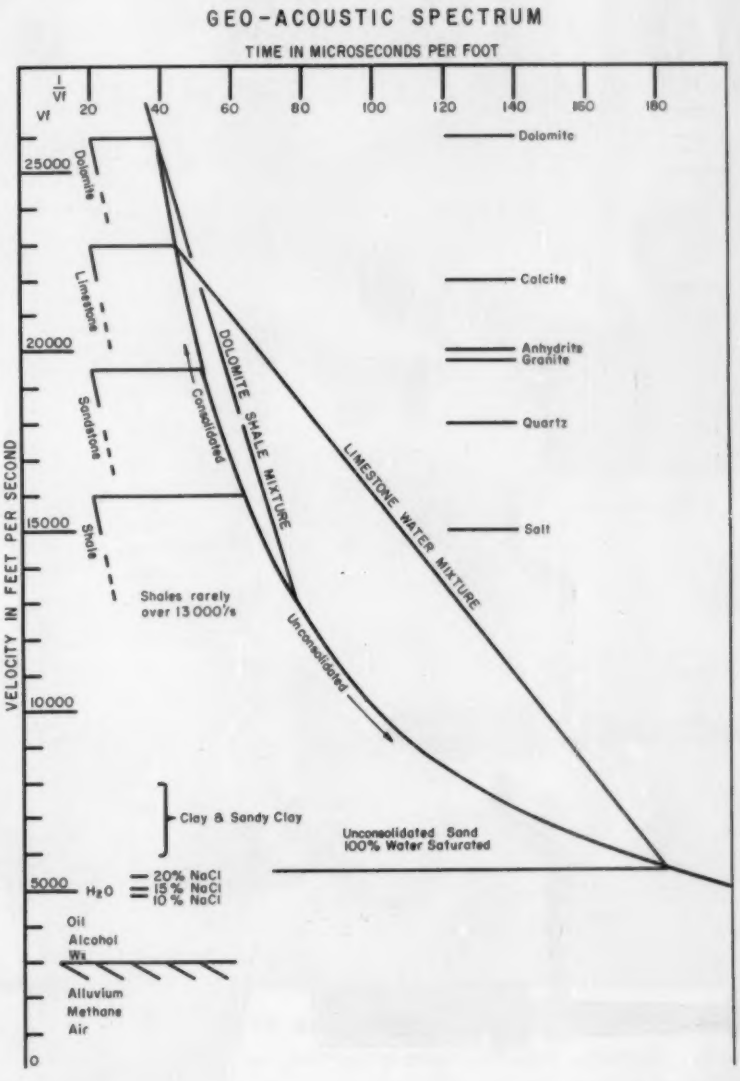
With these fundamntals in mind we may now look at the geoacoustic spectrum knowing the range of the parameters with which we will deal.

A chart of the velocity range we may expect to encounter in the sedimentary section is shown (Fig. 6). Velocity is plotted vertically with reciprocal velocity (microseconds per foot) horizontally.

Dolomite is shown at the top of the chart with the highest velocity, with limestone, sandstone, and shale in descending order of velocity. Some of the purer rocks which are measured commonly in nature such as calcite, anhydrite, granite, quartz, and salt are also indicated on the chart in their relative velocity position. It should be noted that shales rarely have velocities over 13,000 ft. per sec. Clays and sandy clays generally are in the velocity range of 6,000-8,000 ft. per sec. The velocity of water, as indicated by the different salinity content is close to 5,000 ft. per sec., oil approximately 4,000 ft. per sec., alcohol 3,880 ft. per sec. and the weathering around 3,000 ft. per sec., or less. Alluvium is generally found to be about 2,000 ft. per sec., methane 1,400 ft. per sec, and air 1,100 ft. per sec. Along the reciprocal curve the higher-velocity materials are more consolidated and the lower-velocity materials are unconsolidated.

Most sedimentary materials go together as mixtures, and it is not un-

THE VELOCITY range that is expected to be encountered in the sedimentary section. Fig. 6.



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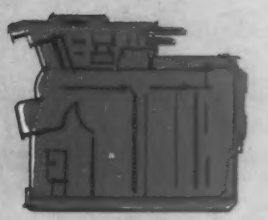
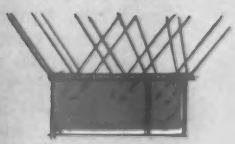
Elevators



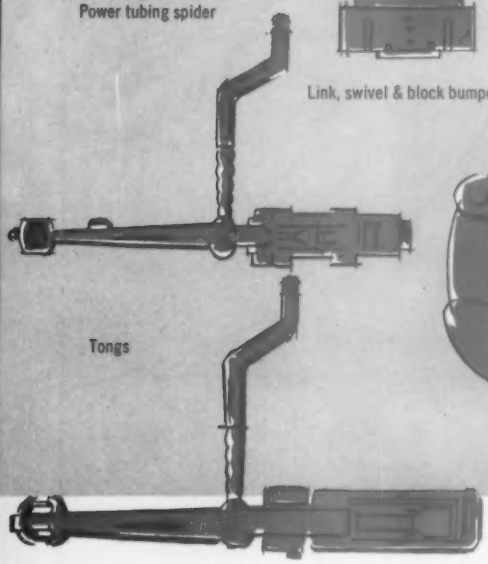
Power tubing spider

Link, swivel & block bumpers

Centralizers

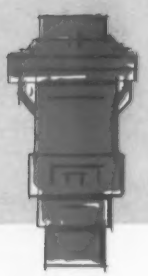


Scratchers



Tongs

Tong dies



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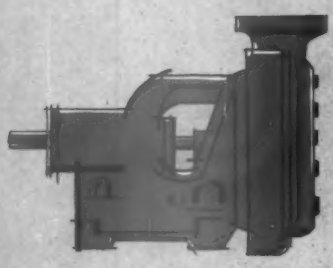
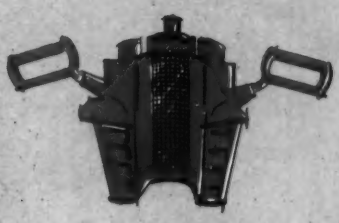
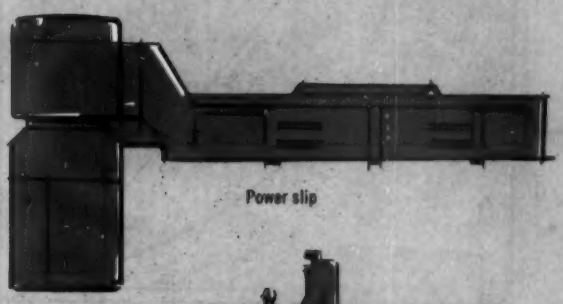


Oil field pumps



Slips

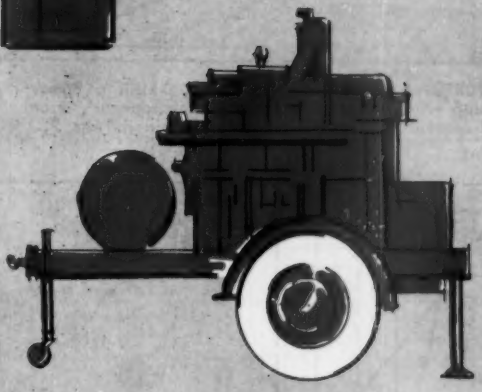


Power slip

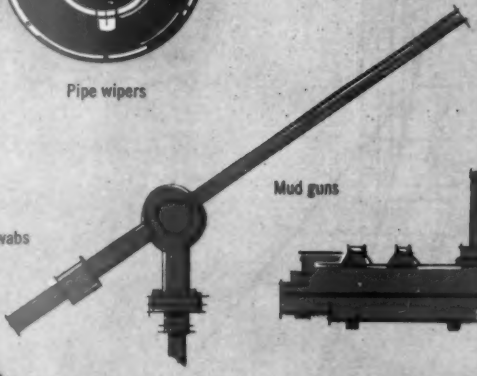
Swabs

Pipe wipers

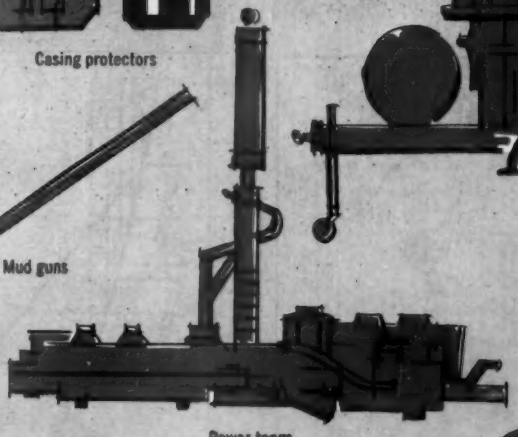
Casing protectors



Pneumatic power unit

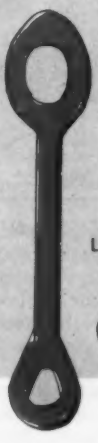


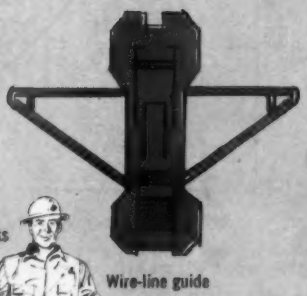
Mud guns



Power tongs

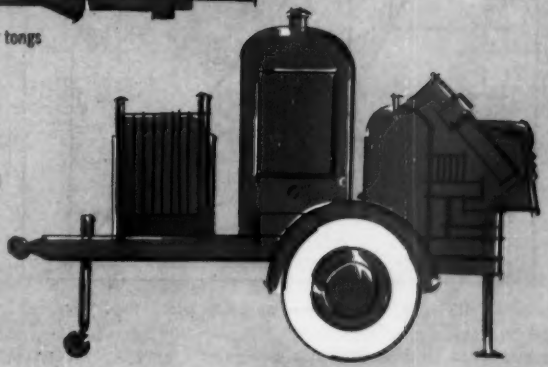
Hooks of all sizes





Links

Wire-line guide



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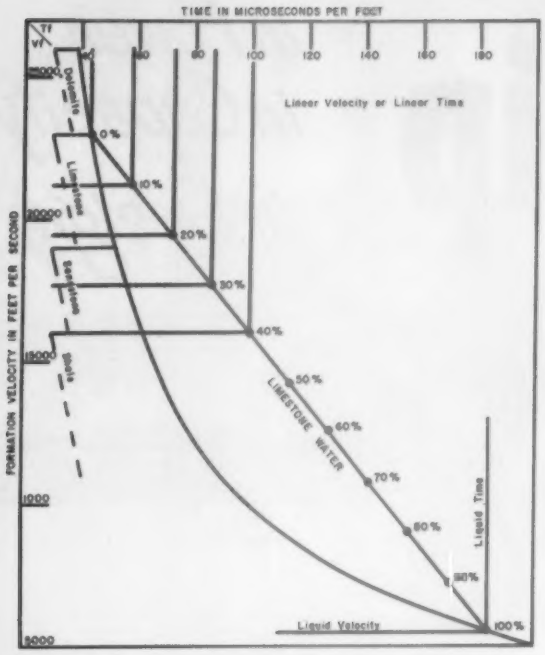
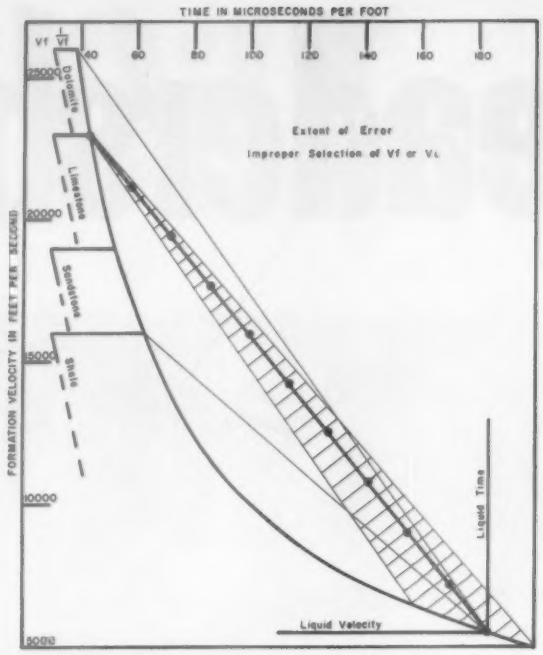
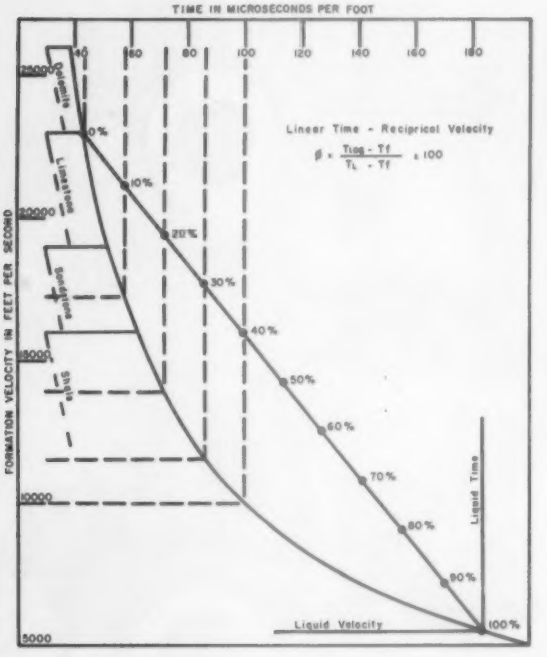


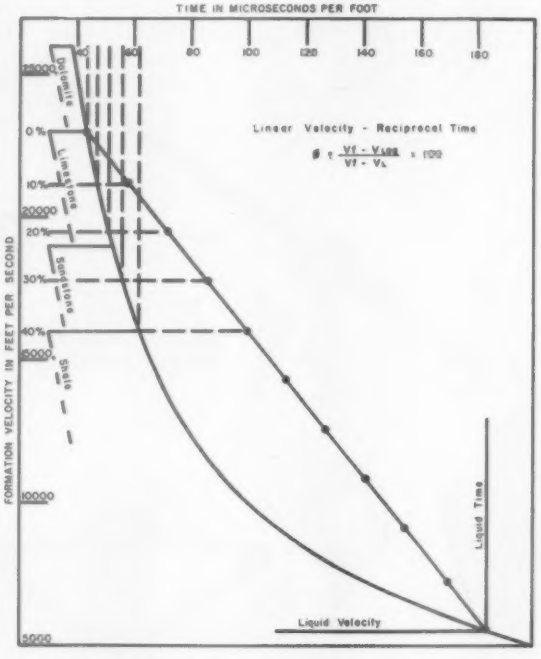
MIXTURES of sedimentary materials exhibit a linear relationship with respect to their acoustic properties. From this, fluid content or porosity can be determined. Fig. 7.



GRAPHICALLY shown is the relative error from the choice of liquid velocity and formation velocity. Fig. 8.



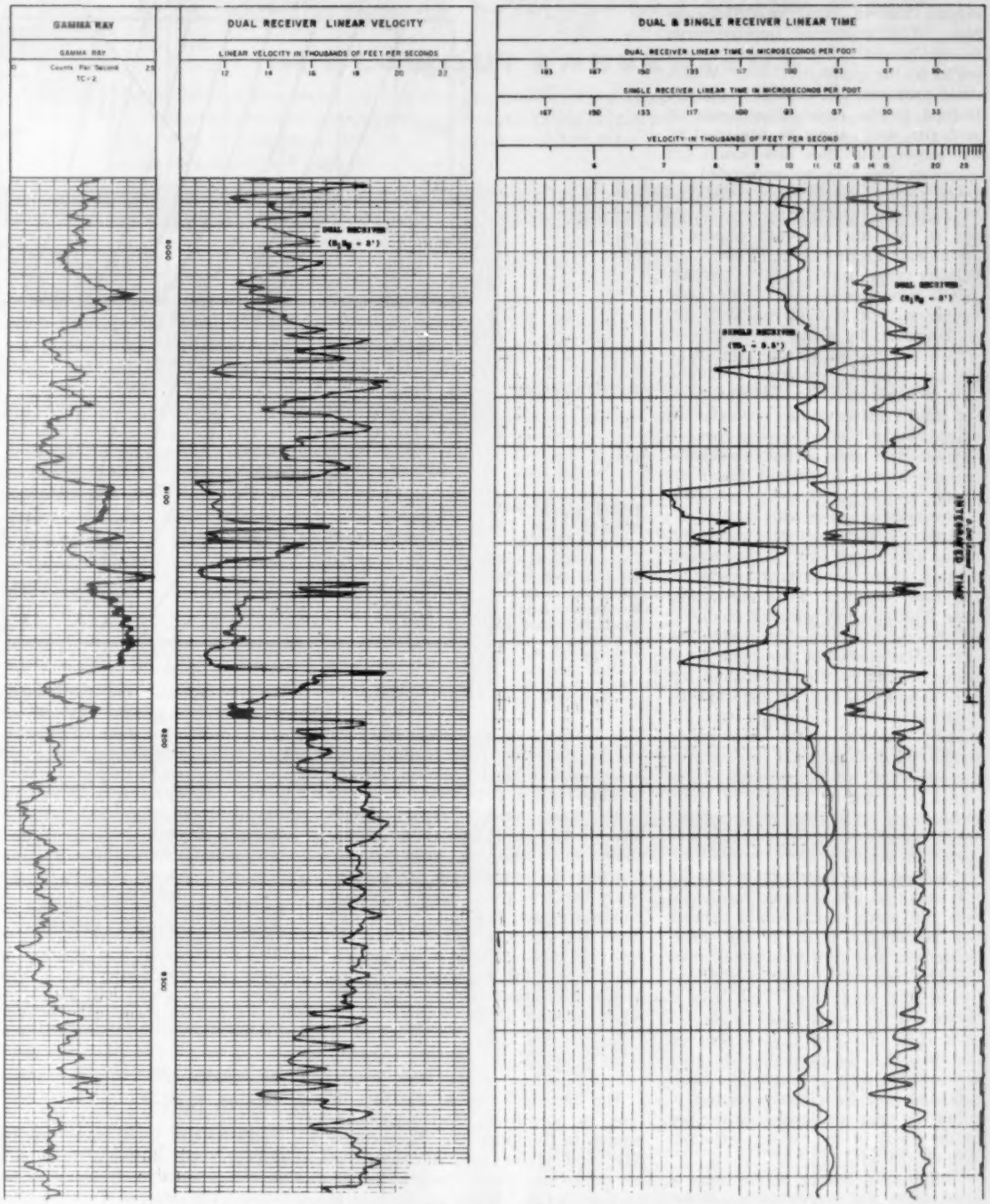
THIS is a linear time porosity plot. Fig. 9.



THIS is a linear velocity porosity plot. Fig. 10.

common to find shaly limes and limy sandstones. It is believed that these mixtures would exhibit a linear relationship with respect to their acoustic properties. A straight line is drawn from the pure limestone velocity of 23,000 ft. per sec. to the velocity point of 5,500 ft. per sec., which represents a velocity of a 100% water-saturated sand of the Gulf Coast. This line is known as a mixture line. Other mixture lines can be shown, such as from dolomite to shale, or sandstone to shale.

Points along these mixture lines may be estimated from drill cuttings. Knowing the material and per cent of the mixture, a line may now be drawn from this formation velocity to the fluid point on the chart which is very similar to the line demonstrated from the limestone to the unconsolidated sand point of 5,500 ft. per sec. velocity. Bear in mind the


GAMMA RAY
DUAL RECEIVER LINEAR VELOCITY
DUAL & SINGLE RECEIVER LINEAR TIME
LINEAR VELOCITY IN THOUSANDS OF FEET PER SECONDS
DUAL RECEIVER LINEAR TIME IN MICROSECONDS PER FOOT
SINGLE RECEIVER LINEAR TIME IN MICROSECONDS PER FOOT
VELOCITY IN THOUSANDS OF FEET PER SECOND
INTEGRATED TIME

THE LOG on the right is the full-spectrum geophysical log with dual and single-receiver logs, and the integration of the dual-receiver log. On the left is the geologists' and engineers' log with simultaneous running of the gamma ray and dual-receiver linear velocity. Fig. 11.

problem since there seems to be no definite relationship between porosity and velocity.

As an aid to the engineer, a set of charts has been made from the equation of Fig. 9 and plotted up as Fig. 11. For logs run in linear time use the upper chart by first determining the correct formation velocity and fluid velocity. Only the fluid velocity of 5,400 ft. per sec. is shown here. Find the log time along the formation velocity line and read the porosity from the curved lines. For instance 68 microseconds per ft. log time would be 10% porosity in a zone of sand with a formation velocity of 18,000 ft. per sec. However, this same time would give a 20% porosity in a pure dolomite of 26,000 ft. per sec. formation velocity.

The lower chart is for logs run in velocity scales using the log velocity similarly to the log time above.

The investigation of porosity with the acoustic log is a byproduct of the work done by the geophysicist on a

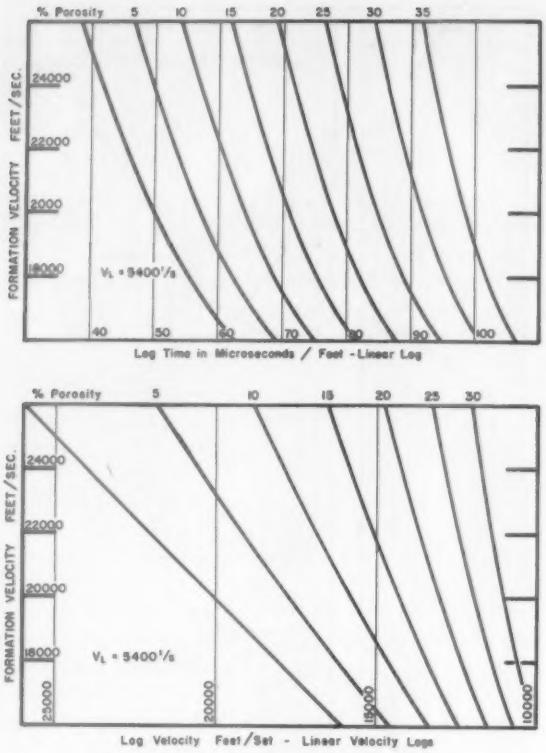
logging tool of great importance to him. With continued improvements to the acoustic log it must remain suited to the geophysical use. Where shale problems are of little economic interest to the reservoir engineer or geologist, they cannot be neglected by the geophysicist. For this reason full spectrum logs are recommended on every logging job. If large scale time logs are used, such as 10 microsecond per ft. per in., it would require a 16-in.-wide logging chart to cover the velocity range from 25,000 ft. per sec. or 40 microseconds per ft. to 5,000 ft. per sec. or 200 microseconds per ft. However, by using the time scale shown on Fig. 12 on the right hand log the complete spectrum is obtainable in linear time. Linear velocity of the dual receiver curve may also be placed on the chart giving the advantage that better detail is available in high-velocity zones with linear velocity; and better detail is available in low-velocity zones with linear time.

Although two-receiver logging has many advantages over single-receiver logging, there are several reasons to run both together. First, misleading false high and low washout character of the dual-receiver log makes the correlation quality of the single much better. Secondly, the misleading signal attenuation can be detected by monitoring with the single receiver. Thirdly, the use of the combination single and dual may aid in determining the depth of penetration of the signal, suggested by Stripling of Mobil in his paper on that the grain material and cementing material influence the formation velocity.

Looking at the mixture line (Fig. 7), it is seen that this line may be divided into 100 parts, which would indicate the percentage fluid in the rock. Therefore, the formation-water mixture line becomes a measure of porosity of the formation. This line is shown on the chart with circles for each 10% of porosity. It is seen on the chart that the percentage porosity is associated with a straight line function and can be directly related to either the time relationship at the top of the chart or the velocity relationship on the left.

Graphically shown is the relative error from the choice of liquid velocity and formation velocity (Fig. 8). It is seen that the liquid velocity shown crosshatched is less critical than the formation velocity in the porosity range commonly observed (0-40%).

A linear time-porosity plot is shown (Fig. 9). The equation for this plot is shown as porosity ϕ, is equal to the log time (T_{Log}) minus the formation time T_f, divided by the liquid time (T_L) minus the formation time, all times 100.



THESE charts were made from the equation in Fig. 9. Top chart is used for logs run in linear time scales. Bottom chart is used for logs run in velocity scales. Fig. 12.

$$\phi = 100\,(T_{Log} - T_f)/(T_L - T_f)$$

If the per cent points are extended to the reciprocal line then the velocity relationship for this function is nonlinear since $T = 1/V$.

The linear velocity aspect of this same derivation is seen (Fig. 10) but shows that with the linear-velocity function the same points on the porosity line will give a greatly reduced nonlinear time function if extended from the reciprocal curve. Here porosity is equal to the formation velocity minus the log velocity divided by the formation velocity minus the liquid velocity, all times 100.

$$\phi = 100\,(V_f - V_{Log})/(V_f - V_l)$$

The empirical plot of velocity, or time, vs. porosity is another good approach to "Velocity Log Characteristics" and Hicks, also of Mobil, in his paper on "Shale Damage in the Springer Shale." When an increase in time is indicated on the single receiver over the dual, either greater depth of investigation was made or the borehole size increased. The latter can be checked with a caliper.

This can be accomplished by running the simultaneous complement of logs shown in Fig. 12. The full-spectrum geophysical log is on the right with dual and single-receiver logs, and the integration of the dual-receiver log. On the left is the geologists' and engineers' log with the simultaneous running of the gamma ray of self-potential on the left tract for lithologic use and the dual-receiver linear velocity on the two-track portion of the log. The dual linear velocity will also be available in expanded scales of time when desired.

We consider this dual recording system favorable to prevent the loss of the basic geophysical data.

It is important to use the proper formation velocities and liquid velocities to obtain the best porosity determinations which may be a local problem. The geophysicist should insist on a full-spectrum scale on every log run.

First Viola oil in North Buffalo

Northwestern Oklahoma's prolific multipay North Buffalo field has its first oil production from Viola-Ordovician. The Harper County field's new oil pay strike is Sinclair Oil & Gas Co. 1 Martha E. Shupe in C SW SW 5-28n-22w, 6½ miles north of Buffalo.

The well flowed 15-20 bbl. of oil per hour plus 3,970 M.c.f.d. Drilling continues. The drill-stem test was at 7,232-77 ft. This will be the second Viola well in the field. Viola production was opened earlier this year at An-Son 1 Bender, ¾ mile southwest in NW SE 7-28n-22w.

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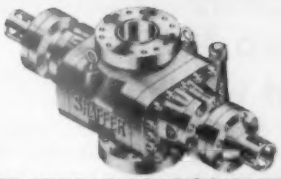

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For further details write for Bulletin No. 1000!

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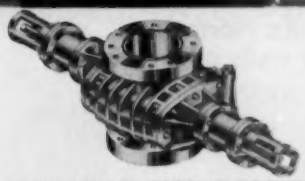

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▸LWS Preventers have all the latest Shaffer design features . . . "Swinging End-Opening" doors for changing rams without loss of hydraulic fluid . . . positive, simple "In-Line" ram and piston design for direct, foolproof operation of rams . . . and many other unique Shaffer advantages.

Bulletin No. 1001 outlines many other Type LWS features. Write for it!

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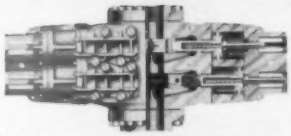

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▸Furthermore the pressure-tight seal is maintained continuously whether the drill string is being raised or lowered, is rotating, or is stationary.

▸These units are ideal for regular drilling, for drilling under pressure, for reverse circulation and for drilling with air or gas instead of mud.

Bulletin No. 1003 has complete information. Send for it!

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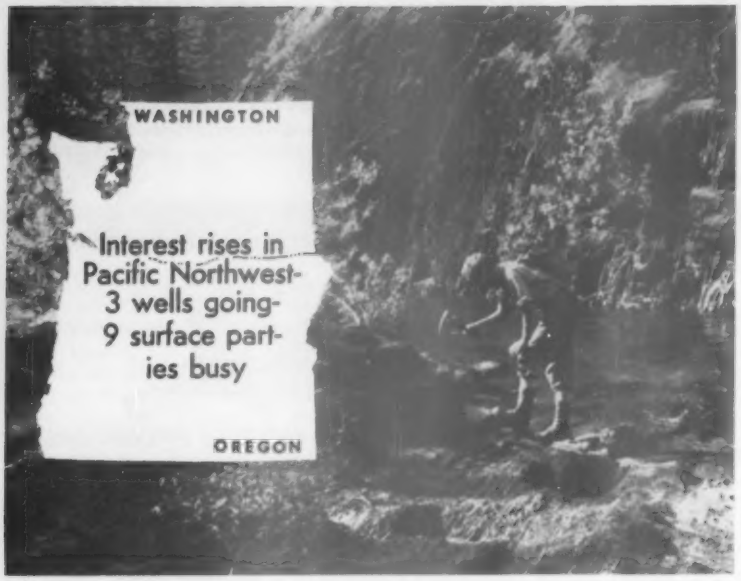


In Olympian woods . . .

Northwest explorers on the go

THERE ARE three active wildcats in the Pacific Northwest, according to Northwest Oil Report, Portland. Two are located in Washington, the other in Oregon.

In Washington . . . Shell Oil Co.'s 1 Zion is at 6,650 ft. The operator is running logs and testing at this Lewis County test. Location is in the Chehalis basin. It is located 6 miles south of the recent dry hole at 1 Sturdevant. The 1 Zion is in the NWc 15-11n-2w. Objective is the Upper Eocene Cowlitz and McIntosh sand.

In the Ocean City area of Grays Harbor County, Wn-Cal Exploration Co. 22 Swanson, N¼c 22-18n-12w, is undergoing repairs before swabbing. After swabbing, the well will deepen to 5,000 ft. This well was originally put down by Utah Consolidated in 1957.

Total depth is 4,357 ft. Wn-Cal plans to test the lower zones found at the state's first producer, Sunshine Mining Co. 1 Medina in 15-18n-12w, 1 mile north.

In Oregon . . . The Nashville area of Lincoln County has one well drilling at 2,300 ft. It is Oregon Oil & Gas Co. 1 Roberts in NE¼ 25-10s-8w. This wildcat is a 2,000-ft. test of Middle Eocene-Burpee.

Other developments in the region include a new Shell test to be drilled in Lewis County. The 1 Thompson will go down in the SWc 34-12n-1w, 14 miles southeast of Chehalis. The Cowlitz and McIntosh sands will be the targets. Colorado-Wyoming Drilling Co. has contract.

In Dallas area, Polk County, Oregon, Ross R. Mitchell and Associates will drill in SE¼ 11-8s-5w. This one will go to 1,000 ft. The Upper Eocene test is 1 mile north of the 1 Bliven which was dry at 1,347 ft. It has a small gas show at 312 ft.

Surface work . . . According to Northwest Oil Report, several companies have parties busy in the region. Humble Oil & Refining Co. has one crew in western Washington, two in South Central Oregon. Shell has two parties in Washington, one party in western Oregon. Standard Oil Co. of California has one party in selected areas of both states. Sunshine Mining has a party in Grays Harbor County, while Western Gulf Oil Corp. has a party working only in summer in western Oregon and Washington.

Sooner Morrow well blows out in Ellis

A GAS WELL in northwestern Oklahoma's Ellis County blew out making 30 M.M.c.f.d. last week. This big Morrow Pennsylvanian gasser is in West Shattuck field, C SE NW 19-21n-25w. It is Oklahoma Natural Gas Co.'s 1 Gibbs, the third well in the field.

This pool was opened in June 1959 at Magnolia Petroleum Co. 1 Schoenhals in C NE SW 24-21n-26w. Production at 9,253-61 ft. was 9 M.M.c.f.d.; the zone at 9,582-9,693 ft. got 10,750 M.c.f.d.; and the interval at 9,762-75 ft. got 13 M.M.c.f.d. The pool is one of the best producers in the gas-producing county.

Deep McAlester test watched

ONE of the most important wildcats ever to go down in Oklahoma's McAlester basin is going on below 10,000 ft. It is Midwest Oil Co.'s 1 Orr in C SW 8-6n-22e, Norris gas field deep test, Latimer County. This southeastern Oklahoma wildcat is being watched closely by regional geologists.

The Cromwell sand was the original target for the well. It was expected at 10,000 ft., but operators are apparently going on in search of that zone. Cromwell is a Basal Pennsylvanian sand below Atoka. The well may go to 12,000 ft. It found 17,500 M.c.f.d. on test of the Atoka at 7,309 ft. earlier.

A deep one . . . This well is the deepest wildcat so far in Latimer County, and the first to shoot for Cromwell sand in this part of the two-state basin.

The well is located on the vast Brazil anticline which is 20 miles long east-west and 6 miles wide. Norris gas field itself is a shallow producer of long standing. Geologically the wildcat could be one of the state's most important tests of the year. It points a finger at the need for deeper drilling, down into the Atokan rocks of the basin, both in Oklahoma and in Arkansas.

Panhandle wildcat hits Oswego-Penn oil

In Oklahoma Sinclair Oil & Gas Co. has completed 1 Overton unit, C NE SW 13-3n-23eCM, wildcat in Beaver County, as an Oswego lime discovery.

The well flowed 260 bbl. of 44°-gravity oil in 16 hours through ½-in. choke from perforations opposite the Oswego Pennsylvanian at 6,318-55 ft. Gas-oil ratio was 1,856-1.

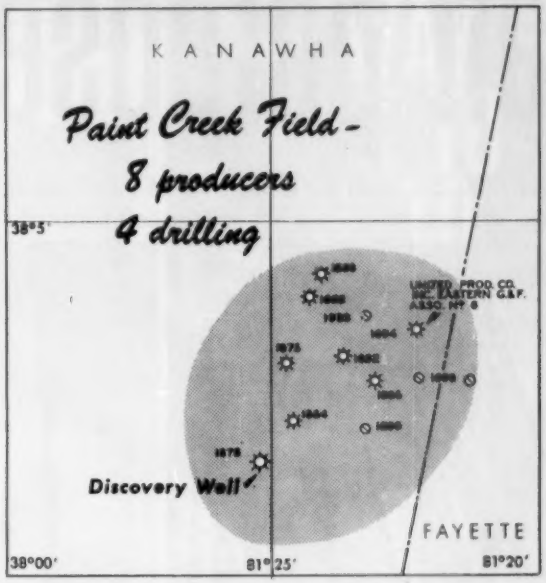
The discovery is located 6 miles south of the town of Beaver, 2 miles south of nearest production, and 15 miles southeast of nearest Oswego production in Floris pool.

Gas hunters busy in West Virginia's Kanawha

WEST VIRGINIA'S Paint Creek gas field now has eight producers. The newest addition to this Kanawha County producing area is United Producing Co., Inc. Well No. 2950, Eastern Gas & Fuel Associates No. 6, Kanawha No. 1694.

United's well flowed open 40,700 M.c.f.d. from Weir sand after fracture. Total depth is 2,173 ft. with 18-hour rock pressure of 735 psi. Location of the well is 13,500 ft. West longitude 81° 20', 11,650 ft. South latitude 38° 5', Cabin Creek district, Montgomery Quadrangle.

Eighth gasser . . . This is the eighth producer in the field. Paint Creek has an open flow potential of 74,915 M.c.f.d. Five wells are located on the Eastern Gas & Fuel Associates lease, which has 17,000 acres, and three wells on the Briar Mountain Coal & Coke Co. et al, lease, which has 3,085 acres on the west adjoining side. United Producing Co., Inc. has four other leases in the general area which extends into Kanawha district, Fayette County. Those four leases contain 19,723 acres.



SHALLOW gas development is paying off well in West Virginia's Cabin Creek district.

Four drilling . . . United Producing Co. has four wells drilling, two each on the Eastern Gas & Fuel Associates and Briar Mountain Coal & Gas Co. et al, lease. One of these was previously drilled dry and temporarily abandoned, but is now being cleaned out and preparations being made to fracture the Weir sand.

Godfrey L. Cabot, Inc. of Charleston, the only other company having an adjacent lease, is drilling the 1502 well on Eastern Gas & Fuel Associ-

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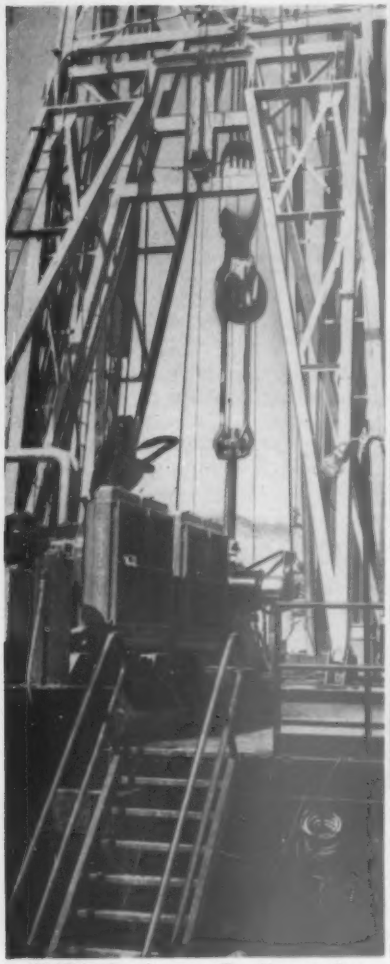

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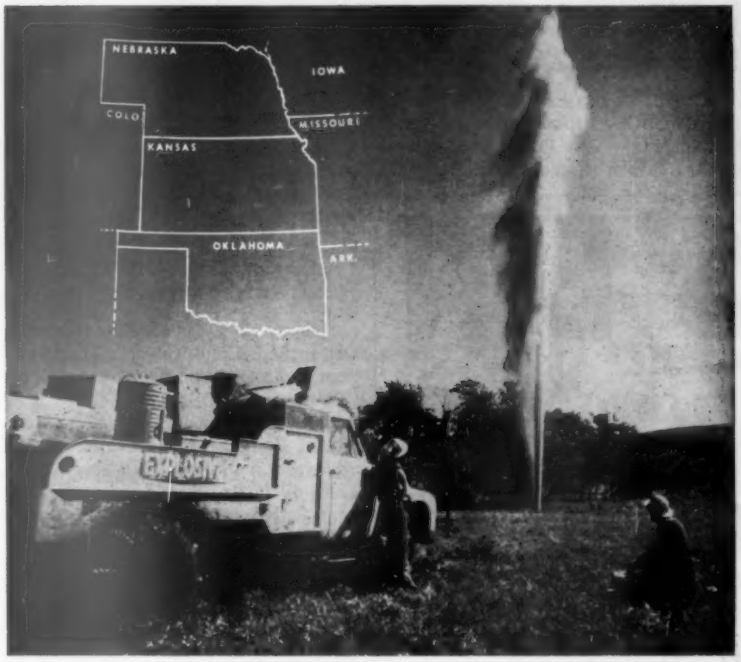
ates No. 2 lease. That well is 22,250 ft. West longitude 81° 15', 5,000 ft. North Latitude 38° 5', Kanawha district, Fayette County, Montgomery Quadrangle. The well is below 2,450 ft.

No market . . . Gas from Paint Creek field has not been marketed. Neither has there been sufficient development to determine the field limits, but the results of the eight wells are encouraging to regional operators just the same.



In Wichita . . .

Mississippian to get countdown

What are some of the problems involved in finding oil and gas reserves in Mississippian rocks under Kansas, Oklahoma, and elsewhere in the Mid-Continent area?

What is the history of some of the recent oil and gas developments in Mississippian strata? How can drilling techniques be improved in regard to the Mississippian?

In short, what are some of the "new frontiers" in the development of Mississippian oil and gas?

These and other what's and how's of Mississippian oil and gas production in the Mid-Continent region will be discussed by Rick P. Clinton, exploration manager of Raymond Oil Co., Wichita, at the AAPG Mid-Continent regional meeting in Wichita, October 28-30, 1959. Clinton's topic will be "History of Petroleum Development of Mississippian Oil and Gas."

Clinton, a native of Iowa and a graduate of the University of Oklahoma, was with the Pure Oil Company for 8 years previous to his present position. He is a member of several professional organizations, including AAPG, AIME, and the Kansas Geological Society (KGS). He has a knowledge of oil and gas geology in the Mid-Continent and has studied developments in Kansas and other mid-continent states. He has published on the geology of Osage County, Oklahoma.

In his presentation at the KGS-sponsored AAPG meeting in Wichita, Clinton will summarize development programs in which the Mississippian was the primary objective and give facts on how reserves in the Mississippian were found. He will concentrate on developments in Kansas and Oklahoma but will include some development history for Utah, Wyoming, Montana, Illinois, and Canada.

Clinton will discuss some of the problems involved in the search for Mississippian oil and gas.

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Hunton wells number three in Anadarko

THE FIRST Hunton Siluro-Devonian producer in the northwestern Anadarko basin has been confirmed. Sinclair Oil & Gas Co. 1 Case, C SE NW 4-22n-16w, 5 miles north of Sherman in Major County, Oklahoma, made 1,040 M.c.f.d. on drill-stem test at 8,258-8,303 ft.

This well is a south offset to the 1 Spafford, completed last winter for an absolute open flow of 5,571 M.c.f.d. plus 40 bbl. condensate in 18 hours on 25/64-in. choke from perforations at 8,271-8,358 ft. That well became the region's first Hunton producer. A bit later, Magnolia Petroleum Co. opened similar production in Custer County. Magnolia's well became Custer's first producer and the basin's second producing area from Hunton lime.

Second sand produces in Sugar Valley discovery

A second gas sand has been perforated in MPS Production Co.-Kilroy Co. of Texas-Van Dyke & Mejlaender's 1 Violet Creech, a Matagorda County, Texas, gas discovery brought in 6 miles northeast of Bay City last June.

The Sugar Valley field-opener is now dually completed in lower Frio zones.

Operators reentered the well to perforate at 9,559-63 ft. It produced at a calculated open-flow rate of 6,300 M.c.f.d. with 30 bbl. of 51.2°-gravity condensate per million. Shut-in casing pressure is 3,362 psi.

The upper zone, perforated from 9,520-30 ft. in the Gravier sand, had an open-flow rate of 27 M.M.c.f.d. with 15 bbl. of 58°-gravity condensate per million.

Confirmation test is under way 1,400 ft. west of the discovery well.

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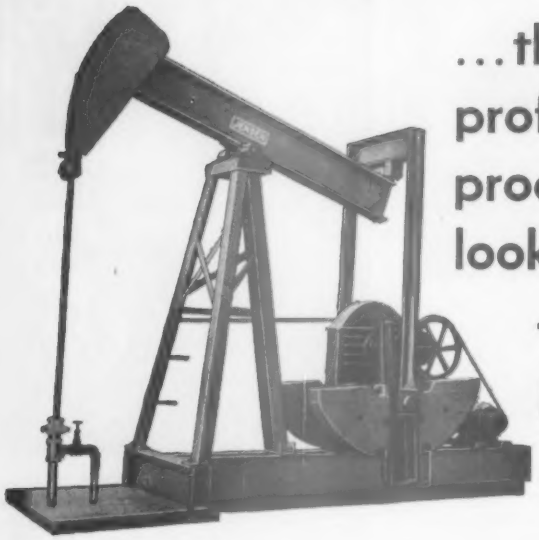

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Texas offset produces

An offset to a conglomerate gas well in Jack County, North Texas, has been completed as a flush oil producer.

Ambassador Oil Corp., Fort Worth, 2 Shawver "G" in Jack County, Texas, flowed at the rate of 492 bbl. of 42° oil in 24 hours on 32/64-in. choke. The well flowed 82 bbl. of oil in four hours after fracturing. Gas-oil ratio was 375:1. Production is through perforations from 4,850-63 ft. from the Atoka conglomerate in the Wizard Wells 4,900-ft. Caddo conglomerate field.

The well is located 1,122 ft. from the south line and 330 ft. from the west line of the lease on the G. A. Freeman Survey, A-2194, Jack County.

New Mexico well logs more pay

ADDITIONAL pay in the Bone Spring has been tested at Ohio Oil Co. 1-NPA-1 State, Lea County, New Mexico. Location is 15 miles northwest of Monument, in 6-19s-35e.

Bone Spring production was indicated at 10,148-83 ft. where a drill-stem test recovered 100 ft. of heavily oil and gas-cut mud, 950 ft. of clean oil, and 1,000 ft. of oil-cut water blanket.

The additional pay was between 10,185-10,243 ft. Recovery in 2 hours from that interval was 3,900 ft. of gas in drill pipe, 10 ft. of 33.7° oil, oil and gas-cut water blanket, plus 75 ft. of drilling mud. Flowing pressure was around 500 psi. Thirty-minute shut-in pressure was 4,040 psi.

Ohio's wildcat has also recovered oil from the Brushy Canyon at 6,778-6,878 ft., and from the Cherry Canyon at 5,887-5,925 ft.

Wright Mountain is East Texas hot spot

WRIGHT MOUNTAIN field (Lower Pettet) in northeastern Smith County, East Texas, is undergoing another of its occasional spurts in drilling activity.

The long and narrow field (5 by 1 mile) is about 5 miles southwest of Gladewater, at its northeast end. Normal development drilling, plus long stepouts to the south-southwest now have production within 2 miles of Chapel Hill field. The field's development has been aptly described as "trendology" technique at its best.

Latest in the extension wells is Halbert Drilling Co. of Tyler 1 Henry Mitchell. Location is on a 100-acre tract in the John Slaydon Survey, A-856. It is 1 mile from nearest Pettet production in the field, and 10½ miles southwest of Gladewater. Initial production in the Mitchell well was 235 bbl. of 43.5° oil in 22 hours, flowing through ¼-in. choke, under tubing pressure of 410 psi. Gas-oil ratio was 865:1.

Before completion potentials had been made on the Mitchell extension, another well approximately 2 miles farther south had reported Pettet production. Arkansas Louisiana Gas Co. 1 R. L. Bergfield flowed an estimated 50-60 bbl. of oil a day from perforations at 8,474-83 ft. The well then was shut in while operators erected storage tanks.

Location of 1 Bergfield is 9 miles west of Kilgore, on an 86-acre tract in John Slaydon Survey, A-856. Total depth was 8,600 ft., cased to 8,559 ft.

New test in the area is Claud B. Hamill, Houston, 1 Louis B. Gilbert. Location is in the south extension area, approximately ¼ mile due east of Halbert's 1 Mitchell. Projected depth is 8,600 ft. A Halbert Drilling Co. rig was drilling below 4,370 ft. at last report.

Current daily allowable for the Wright Mountain-Pettet field is 8,821 bbl., from 65 wells, according to the Texas Railroad Commission.

Lake Erie's second try is failure

WORKMEN are plugging a well drilled in Lake Erie after an unsuccessful attempt to find gas. It was the second offshore well drilled by New York State Natural Gas Corp. in Pennsylvania waters. The first well, drilled last year, had an open flow of 200 M.c.f.d. of gas.

The second well, located 3.6 miles from shore near North East, Pa., and about 7 miles from the New York border, was drilled to a depth of about 4,740 ft. before the effort was discontinued. The well is being plugged to the total depth and will be sealed off at lake bottom and abandoned.

Sharing in the expense of drilling the second well was the Kewanee Oil Co. of Philadelphia, who bought a part interest this year in the state tract in which the well was drilled.

When plugging operations are completed, the portable drilling platform will be towed to a point near Erie for the winter.

Although the company plans to drill another well next spring, it has not yet decided whether to locate in the same tract as this year or in the tract near the Ohio border where the first well was drilled in 1958.

Canadians look north to winter

WITH WINTER fast approaching, the industry in western Canada is again turning its sights to explore in the north country. The many discoveries of high significance last winter plus the recent oil and gas discovery in the Yukon makes this win-

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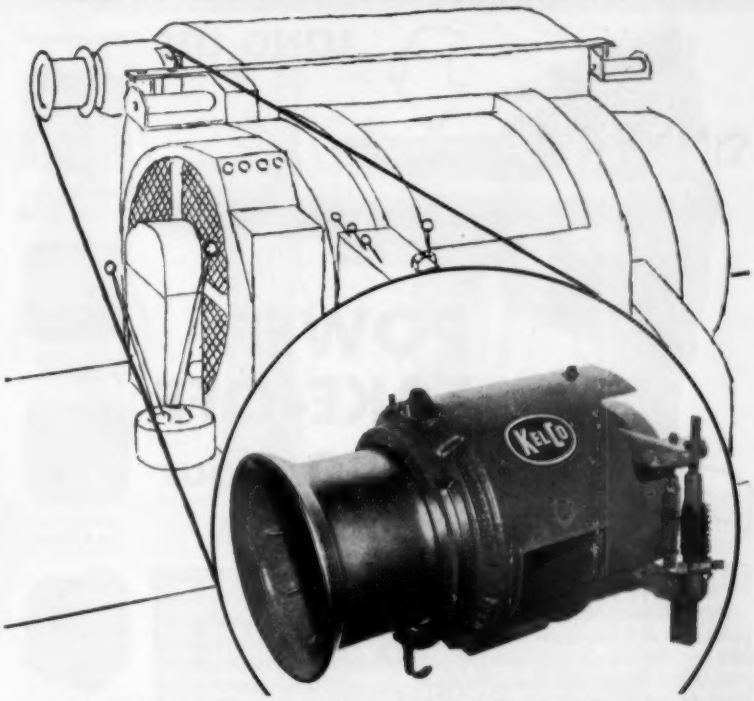

For almost 20 years, KelCo, the originator of the spinning line cathead, has been supplying the needs of major companies and drilling contractors. KelCo Spinning Line and Breakout Catheads are available in three sizes and 32 different models to meet the requirements of both shallow and deep drilling.

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ter's discovery prospects higher yet.

Particular attention is being paid northeastern British Columbia this fall where it is reported that operating companies are paying down time for rigs to keep them in the general Fort Nelson area. Immediate starts may be made on important wildcat locations right after freezeup.

Rigs running . . . There are 37 rigs in British Columbia and 5 in the Northwest Territories. Of those in northeastern B.C., 21 are making hole while only one is working in the N.W.T. The bulk of the rigs currently down in B.C. are situated around the virgin district surrounding Fort Nelson and should begin working in a month or two. In the Northwest Territories and Yukon, however, activity is a bit more remote and it is not known how soon operations will begin on at least three wildcats. Rigs are being moved to the two areas and it is hoped that activity will begin this fall or early winter.

In northeastern B.C. estimates on the amount of drilling to be done this winter run as much as 60% higher than that done last year—or 150 wells. Although much drilling is expected in the Fort St. John area, the more interesting wildcats will be drilled near Fort Nelson, 260 miles north.

The two B.C. areas in the current interest lead are Jedney-Bubbles, and the Kotcho Lake-Petitot River-Clarke Lake area. All are major gas discoveries.

Gas outlet . . . A gas line has already been started to Jedney-Bubbles. Output from this area will add 55 M.M. c.f.d. to the Westcoast Transmission Big Inch line.

The Fort Nelson area will have to be developed more before pipeline facilities are pushed that far north, although a route has been studied and planning is under way.

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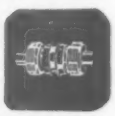

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Rare Kione hit in Sacramento Valley

A WILDCAT drilled by Buttes Gas & Oil Co. in the Corning area of Tehama County was completed in a Kione sand as a new pool discovery. This is the first production found in this sand north of Beehive Bend gas field.

The zone was perforated at 2,340-54 ft. Initial production settled at 16,970 M.c.f.d. through a 1-in. choke. This was by far the highest flow rate of any previous gas well drilled by Buttes in the area.

The Kione formation lies under the entire Sutter Buttes and Corning areas where Buttes Gas & Oil has leases covering some 61,000 acres. With General Petroleum Corp., Texaco Inc., and Humble Oil & Refining Co. holding leases on virtually all the land surrounding the Buttes discovery, an active drilling play is expected in the area.

The discovery, A-5 Saldubehere, is located about ½ mile west of the nearest producer in the South Dome gas field and about 25 miles north of the Kione Sand production at Beehive Bend gas field in Glenn County.

Other significant highlights in the northern California gas search included:

. . . Wild Goose. Honolulu Oil Corp. extended production in this Butte County gas field with a well in SE SW 17-17n-17e, about ¼ mile south of the nearest field producer. The well, 5 Honolulu-Humble-Wild Goose, was brought in flowing 750 M.c.f.d. from selectively perforated intervals between 2,624-3,305 ft.

. . . Willow Pass. Trico Oil & Gas Co. gave the northwest Willow Pass gas field of Contra Costa County a new pool discovery with a well about ¾ mile northwest of Willow Pass gas field. The well tapped the new pool between 3,076-3,208 ft. Initial production was 1,200 M.c.f.d. through an 18/64-in. choke.

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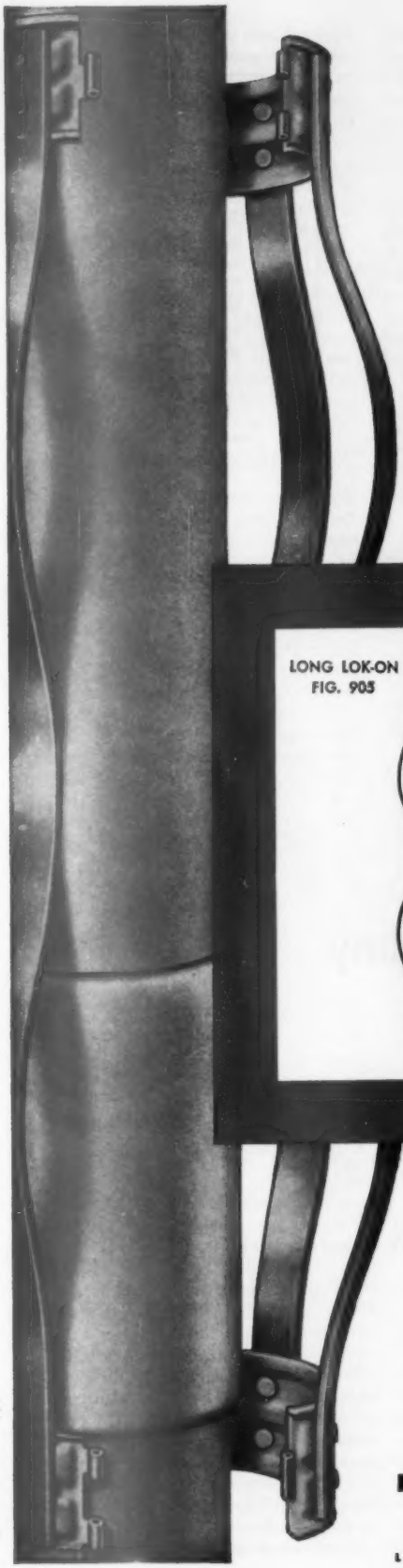

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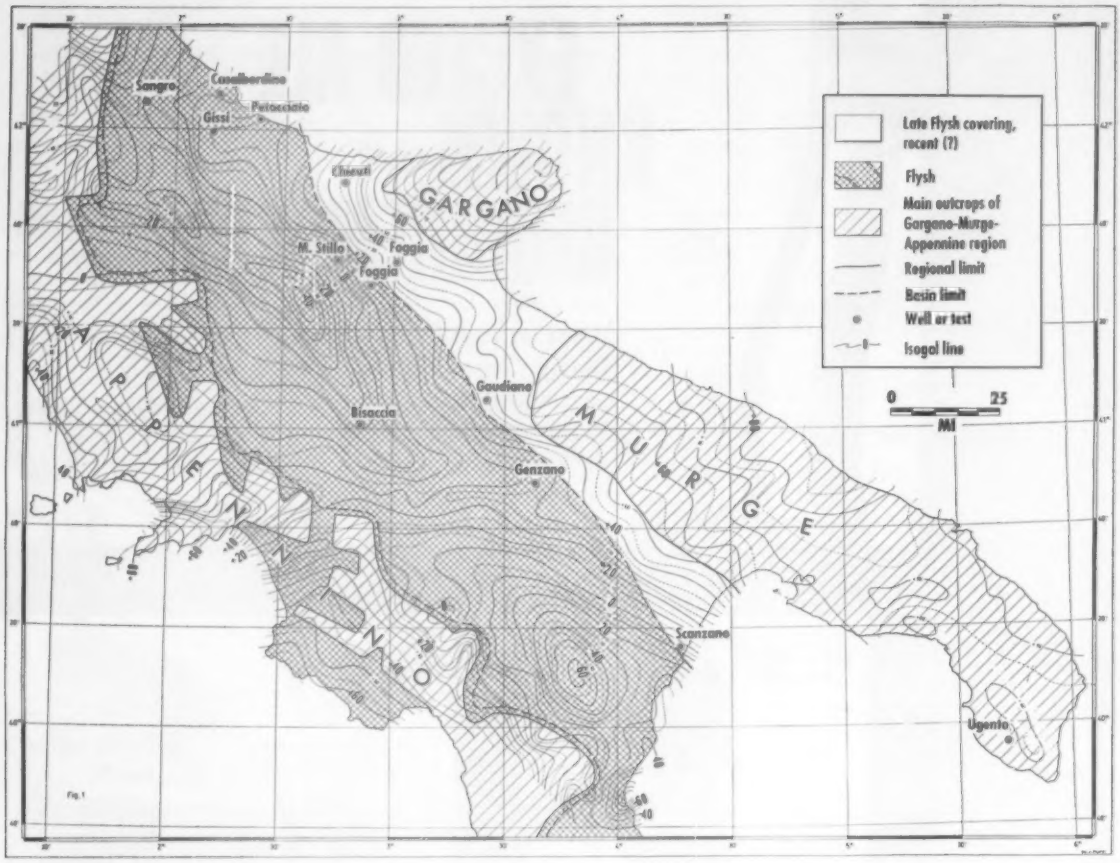


In southern Italy . . .

Three basins need explorer's scrutiny

BY ENZO BENEO
Director, Geological Survey of Italy

IN 1954 the Geological Survey of Italy initiated a new systematic survey of the southern part of the country. Today the program is practically complete.

Much information that was formerly ignored has been put in evidence. For example, the limits within which the paleontologic - lithologic criteria may be applied. Similarly, many other data heretofore considered of little interest have now assumed preeminent importance, such as the relation between facies, details of correlations, and the presence of the so-called exotic rock masses.

Results obtained by the Sicilian survey have been widely adopted because of the structural similarity of the two areas. New ideas about sedimentation at oceanic depths have greatly aided attempts to explain the genesis of certain sediments. All this has given origin to a satisfactory synthesis which may be confirmed by the new efforts.

This is an abridged version of the paper given at the Fifth World Petroleum Congress.

Geologic sketch . . . Geologically, southern Italy is divided into three longitudinal sectors. The two lateral ones, Apennine sector and Gargano-Murge sector, are both characterized by exposures of calcareous dolomitic rocks ranging from Triassic to Miocene in age. The central sector is characterized by a tectonic sink involving these same rocks, and filled with clastic sediments of flysch facies of Upper Miocene age and, partly, of Pliocene age.

. . . The Apennine. This sector is characterized by numerous intersecting systems of normal and inverse faults and by rare folding.

. . . The Gargano-Murge. This sector, excepting where the Foggia area is separated by a series of northeast-southwest faults, has a continuous tectonic trend with an important system of step-faults along its inner border.

The stratigraphic columns of the outcrops in both sectors are very similar. These exposures are of calcareous - dolomitic rocks of Triassic-Miocene age, the younger portion terminating with marls, clays, gypsums, sandstones, and breccia. Sometimes the Jurassic and Eocene rocks are missing. The Miocene is very discontinuous and is nearly always unconformable with the Mesozoic but more rarely so with the Paleogene; its exposures are of modest size compared with those of the Mesozoic, and usually are located on the borders of monoclines.

In the Gargano-Murge sector exposures of Triassic are unknown. It is doubtful that the Jurassic is present.

. . . Central area. The Central sec-

tor which comprises the area between the two large and opposite calcareous exposures, is generally composed of soft sediments prone to sliding actions; they have been classified as "flysch." This consists of a succession of thick strata of more or less sandy shales sometimes variegated in color and scaly in texture, with alternations of calcarenites or conglomerates, calcareous breccia, and of very fine-grained limestone strata. Present within this succession are many olistostroma of variable thickness containing olistolites of varying age and size, whose microfauna dates from Cretaceous to the Middle Miocene. The flysch, in most cases, has remained very thick.

Origin and Age of Flysch

To determine the age of flysch, a good lithologtic map was compiled. All possible stratigraphic successions in the area were studied; both the lateral and vertical variations of facies have been noted. Studies have also been made of the contacts between this terrain and that of the Apennine sector; in the Gargano-Murge sector obliterating conditions render impossible this study of the contacts.

Presumably in the Gargano-Murge sector, these contacts are always due to faulting, while in the Apennine sector they are almost always so. But here are some zones where the contacts are in simple and normal succession upon the Mesozoic or the Upper Miocene strata, as can be amply verified west of the Sangro River. Therefore, the flysch should be a facies of the Upper Miocene or of a more recent age.

All the microfauna (and eventually also the macrofauna) older than Upper Miocene found in the flysch has been reworked and therefore is of no stratigraphic value. It now remains to be seen how such an almost wholly stratified sedimentary accumulation could have been generated to fill a probably preexisting submarine tectonic trough which possibly is gradually sinking.

Sedimentational conditions . . . The flysch consists of clastic rocks formed by very coarse to very fine elements and by variable quantities of clays. All are lenticular depositions differing in extent, and strata with graded elements often may be noted. The vertical lithological successions and their thicknesses differ from zone to zone.

The flysch consists of successive deposits caused by dense and turbid currents, forming stratified accumulations of lithological elements of dimensions proportional to the density and the velocity of the currents, and containing all the original microfauna. Periods of rapid deposition are interrupted by periods of pause or of calm causing sedimentation at a slow rate favoring the development of microorganisms.

The chaotic accumulations (olistostroma) are rare in the outcrops. They are probably the results of landslides of flysch lying in an instable position on the flanks of the trough during its gradual rise. Above all, these are distinguished by the presence of enclosed large and small rock masses generally belonging to the calcareous series from the Triassic to the Miocene of the Apennine sector. But much more rare is the presence of large blocks of basic eruptive rocks.

As yet there is no clear idea as to the source of the stratified material. It is supposed that the problem may best be faced by making increasingly accurate analyses in the field, validly aided with laboratory research. But above all it is believed that a more final solution will result from the progress of our knowledge of the laws governing the actual oceanographic sedimentation.

(Next week: Part 2)

Big oiler in Buckeye pool

IN OHIO'S Walhonding area, New Castle Township, Coshocton County, Roy Weed announced his sixth well on the M. W. C. District, Lot 10, 2 Qt., flowed at the rate of 500 barrels oil per day with 750 M.c.f.d. of gas after fracture.

The Clinton sand was reported at 3,170-3,240 ft. with only a minor break and had 45 bbl. natural. Spudding has started on a new location about 1,000 ft. southwest.

Canaan . . . R. B. Martin announced his southern stepout to the Canaan pool, 1 John Armstrong, Section 32, Canaan Township, Wayne County, had a flow of 200 barrels oil per day and 900 M.c.f.d. after fracture.

Natural production from the pay in the Clinton sand at 3,337-46 ft. was 4 bbl. oil and 150 M.c.f.d.

A scheduled Clinton test by Barton Holl in an oil play in south-central Marion Township, Hocking County, had a strike in the Newburg sand at 2,158-62 ft.

The Carl C. Poling, Section 34, gaged 877 M.c.f.d. natural and is now under test. The nearest reported Newburg production is 16 miles southwest in Laurel Township, Hocking County.

Old Hoosier area awakens

NEARLY 10 YEARS have passed since the area 3 miles northwest of Elberfeld in Gibson County, southwestern Indiana, found oil. Earlier this year a revival program began in this corner of the Illinois basin—and with great success.

Cobra Oil & Gas Co. started the campaign at 1 Ed Stratman Heirs in SE SE SE 15-4s-10w. The well made 50 bbl. of oil per day from the Jackson Mississippian sand at 1,811-18 ft. This summer the 1 Ernest Stratman in NW NW SE Section 15 made 110 bbl. per day from the same zone at 1,802-36 ft. Another operator, T. W. George, has completed five producers in the area; W. Leon Wright has completed six wells; Skiles Oil completed one. Production from all the wells is from Jackson sand. Initials range up to 140 bbl. daily.

Illinois drilling runs strong

Exploration in the Illinois part of the Illinois basin continues strong. In Wayne County, 8 miles southwest of Johnsonville, T. R. Lindsay will test the Aux Vases at 2,792-2,810 ft. at the 1 Nelson Keen in SW NE SE 31-1n-5e. Recovery on drill-stem test at 2,790-2,822 ft. was 1,440 ft. gas, 185 ft. of clean oil.

In Hamilton County, 6 miles west of Norris City, Rockford Petroleum Co. has a new-pay strike. The new pay is McClosky lime at 3,214-20 ft. The well pumped and flowed 54 bbl. of oil in 2 hours, natural. It is the 1 Ben Johnson in SE NE NE 26-6s-7e.

In Williamson County, the 1 Madison "E," NW NE SW 15-8s-3e, 6 miles northeast of Marion, has been completed by Mutual Oil & Gas Co. and Hal S. Lobree. It made 105 bbl. of oil per day from Cypress sand at 2,285-2,311 ft. This is one of the most important developments of the year in the basin due to its southerly position.

(Photos courtesy The Link)

RIG DRILLING at East LaBarge overlooks the Green River and town of LaBarge. LaBarge was originally named Tulsa during its early boom days.

DEVELOPMENT foreman, Hayward Graves and Engineer Loy Harris discuss tests on Figure Four Canyon Unit.

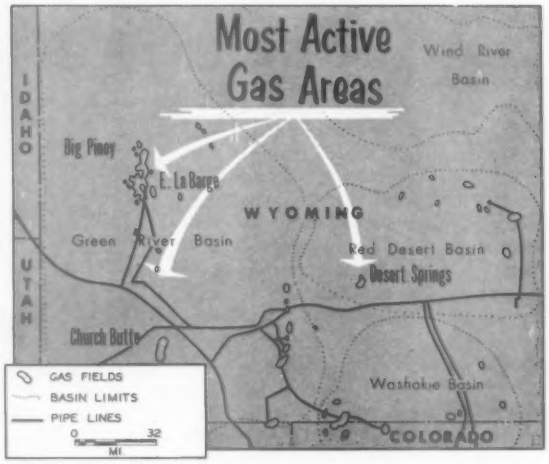
FIGURE FOUR Canyon Unit's discovery well made a record 18 M.M.c.f.d.

These scenes depict . . .

Green River's ascent in gas circles

RIG LIGHTS have replaced the darkness of southwestern Wyoming's Green River basin. Gas exploration has turned this big region into one of the busiest wildcat theaters in the country.

A few years ago the big target in Wyoming was oil. Gas reserves in those days were thought to be too small and too far from market. All that has changed. Significant gas strikes in separate corners of Green River indicate an ample supply of fuel. Newly completed pipelines lead to eager markets on the West Coast and in the Denver area.



GREEN RIVER basin is the busiest new gas-hunting arena in the Rockies. Since 1957 more than 221 wells have been completed here.

The record . . . Since 1957 well completions in the Green River basin total 221. The LaBarge platform is the focal point of most of the big gas development. There is activity in 34 large unitized blocks of acreage around this section of the basin. One of the best recent strikes here is Carter Oil Co.'s 1 Figure Four Canyon. That well had an open-flow potential of 18 M.M.c.f.d. New strikes, offsets, confirmations, and pure field-development drilling enlarges the basin's potential as a major gas reservoir for the Rockies—and, indeed, the nation.

The basin . . . Green River is one of the biggest basins in the country—the second biggest in Wyoming. It is also one of the least-explored and exploited oil and gas bowls in the country.

The basin is divided into three units: the Red Desert, the Washakie, and Green River. Green River basin sweeps from the continental divide west of Rawlins to the Bear River divide near the Utah line, then north to the Wind River Mountains. It is the home of some real oldtimers in Rocky Mountain gas and oil history. Fields like Church Buttes, the Baxter Basin fields, Hiawatha.

Units . . . Green River basin is 70% government-owned. Because of predominant federal ownership and the large size of geological features, most oil or gas prospects are organized into federal acreage units. These range in size from 1,500 to 135,000 acres, and represent the pooled interests of several oil companies. The company holding majority interest in the acreage customarily takes the initiative in organizing and operating the unit.

Carter Oil Co. is operator of the Figure Four Canyon Unit. The Tulsa company holds about 25% interest in the Dry Piney, East LaBarge, Wamsutter, Tipton, and Creston units (all ranging from 15,000 to 84,000 acres in size) plus varying smaller interest in other units.

Good conservation practice is exemplified by the units, which bring together all leases overlying an oil or gas prospect. This eliminates unnecessary offset wells and encourages placement of wells for most efficient recovery of oil or gas. It also makes possible early use of secondary recovery and other conservation measures on a field-wide basis.

Great future . . . Green River basin has a bright growth ahead. With the search for gas picking up momentum throughout the Rockies, this southwestern Wyoming basin will see much action in the coming years. This year should be one of its best successwise. Already more discoveries have been completed in the huge basin this year than in any other comparable period.

"On 12,000' holes in Martin County, Texas, we were able to cut our overall reamer costs by 60 to 70% when using the Knobby cutter," said Joe Mabee (left) drilling superintendent for Mabee Drilling Company. He is shown with Gene Wyatt, Drilco representative, examining a new Knobby at Mabee Rig #20.

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. . . insures full gage hole at reamer above bit even when bit has lost gage badly.

. . . concentrates crushing load against formation at tips of compacts, thus decreasing overall bearing loads as compared to a flat tooth cutter.

. . . is designed so that spacing between carbides on cutter allows reamer to be run in hole over-gage to under ream hole and insure new bit going to bottom.

. . . means that long life of carbides greatly reduces outside wear on cutter.

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West Texas data book released

Petroleum Review, Scurry County, Texas, is ready for distribution by Phifer Petroleum Publications, Houston. The new oil reference book is the latest in a series which outlines the discovery, development, and production of oil and gas in West Texas.

The review was compiled from the records and hearing files of the Texas Railroad Commission and various other sources.

The individual field record lists location, discovery well, surveys (block and section numbers), known subsurface structural data, rules and regulations, and other pertinent facts and figures. Production for each field is given by years and cumulatively, listing the number of producing wells. Among the illustrations in the book are subsurface structure maps and logs of discovery wells. There is also a map of Scurry County with the fields in color. Information is current through June 1959.

Copies are available from the publisher at P. O. Box 6014, Houston 6.

Oil found in Wyoming gas area

A SURPRISE Almond Upper Cretaceous oil discovery in the Green River basin is Texas National Petroleum Co. 1 Government-Withers in SW NE NE 32-20n-99w, Sweetwater County, Wyoming.

This well, 3 miles south of West Desert Springs Almond gas field, flowed 96 bbl. of 44.6°-gravity oil in 6 hours on 20/64-in. choke from perforations in four zones between 3,556 and 3,616 ft.

Almond (Mesaverde) was topped at 3,555 ft. on logs. Closest production is at West Desert Springs field to the north. That well made 9 M.M.c.f.d. from Almond. The Arch Mesaverde gas unit is 7½ miles southeast.

Rig moves onto Mexican border site

ACTIVITY along the California-Mexico border was slated to pick up with one test on the books. It is:

. . . **Yuha Basin.** De Anza Oil Co., Ltd., was planning to move in equipment to deepen the 825 ft. 1 F. G. W.-De Anza to 1,300 ft. Operations were halted last August due to the extremely hot weather in this region 3½ miles north of the Mexican border about 20 miles west of El Centro in Imperial County.

Discovery wells

ARKANSAS

Yell County: Shell Oil Co. 1 T. V. Jones et al. 19-7n-21w, 2½ miles southeast of Delaware. Open-flow potential 333 M.c.f.d., dry gas, open hole 3,882-4,065 ft., Atoka. TD 10,509 ft. New-field discovery.

CALIFORNIA

Kern County: Humble Oil & Refining Co. 1 Humble-Sledge et al. NE NW 35-29s-26e, 168 BOPD, 33° gravity, 10/64-in. choke, 0.1% cut, perfs. 6,722-54 ft., TD 6,936 ft. (New pool discovery ½ mile north of Bellevue field and ¾ mile south of Rosedal field.)

Kern County: Producing Properties, Inc. E-3-17 C.W.O.D., NW SW 17-32s-25e, 15 BOPD, 14.5° gravity, 9% cut, perfs. 465-95 ft., TD 695 ft. (New pool discovery in Midway Sunset field.)

San Joaquin County: Porter Sesnon-Great Basins Petroleum Co. 26-14 Vernalis Unit, NW SW 14-3s-6e, dual zone completion, upper at 3,100 ft. making 4,900 M.c.f.d., ½ in. choke; lower zone at 3,300 ft. making 3,400 M.c.f.d. through ½-in. choke., TD 3,950 ft. (New Garza zone discovery 1 mile east of nearest Vernalis field producer.)

Tehama County: Buttes Oil & Gas Co. A-5 Saldubehere, SW NE 36-24n-3w, 1,450 M.c.f.d., ⅜-in. choke, perfs. 2,340-54 ft., TD 3,043 ft. (Kione sand pool discovery ½ mile west of South Dome gas field).

WESTERN CANADA

Alberta: Mobil Oil 6-9-62-12 Pine Ridge, LSD 6, 9-62-12w5. Beaverhill Lake oil discovery. TD 8,914 ft.

Calta CPOG 7-21-27-19 Wayne, LSD 7, 21-27-19, LSD 7, 21-27-19w4. Basal quartz gas discovery. TD 4,620 ft.

Alberta: Pacific 8-2-50-7 Pembina, LSD 8, 2-50-7w5. Cardium oil well. TD 4,287 ft.

Pan American 6-22-50-7 Lob D-3 Pembina, LSD 6, 22-50-7w5. Gas discovery. TD 6,158 ft.

Altana 6-29-34-5 North Sundre, LSD 6, 29-34-5w5. Mississippian gas discovery. TD 9,443 ft.

Shell 14-19-87-7 Worsley, LSD 14, 19-87-7w6. D3 gas discovery. TD 7,581 ft.

Saskatchewan: Kissinger 1-30 Weyburn Crown, LSD 1, 30-6-14w2. Midale oil discovery. TD 4,750 ft.

COLORADO

Adams County: Ginther, Warren, Ginther 2 UPRR Noonan Ranch, C NE SW 13-3s-59w. IPP 23 BOPD, "J" sand discovery, new field. TD 6,190 ft.

ILLINOIS

Gallatin County: VS&S Drilling Co. 1 Austin "B," SW¼ 3-9s-10e. IP 22 BOPD, 10 BWPD, Aux Vases 2,298-2,807 ft. TD 2,974 ft. Ab Lake extension.

Fayette County: Kewanee Oil Co. 1 Gehle, NW SE NE 13-5n-2e. IP 58 BOPD, 55 BWPD, Dutch Creek 3,466-75 ft. TD 4,529 ft. Opens Wilkerton pool.

Marion County: G. W. Rohman 1-A Frazier, SW SW SE 4-1n-1e, 1 BWPD, 4 BOPD, 1,649-54 ft. TD 1,654 ft. New pay.

Macoupin County: Joseph Waitukaitis 1 Simmermaker, SW NW NE 22-8n-8w. IP 4 BOPD, Penn. 443-451 ft. TD 453 ft. Revival of old pool.

Saline County: Edward E. Rue 1 Oglesby, NW SW NW 27-8s-6e. IP 300 BOPD, Waltersburg 2,046-60 ft. TD 2,970 ft. Extension to South Rawleigh field.

H. E. Howard and J. V. Howell 1 Frieda Gates, NW NE 36-8s-6e. IP 40 BOPD, 30 BWPD, Tar Springs 2,120-30 ft. TD 2,876 ft. Extension to El Dorado Consolidated field.

INDIANA

Posey County: V. R. Gallagher 1 Wilkens Community, NW SE NW 14-7s-12w. IP 45 BOPD, Waltersburg 1,785-92 ft. TD 2,386 ft. East Crunk field discovery.

WEST CENTRAL TEXAS

Callahan County: Tom T. O'Rourke 1 Odom estate, Sec. 18, Blk. 5, SPRR Sur., 2 miles southwest of Admiral. IPP 18 BOPD, 37°, GOR 555:1, pay 696-708 ft. TD 1,218 ft.

Coleman County: Edlo-Texas Corp. 1 R. S. Adian, Sec. 88, Blk. 1, GH&H Sur., 1 mile north of Fisk. IP 4,500 M.c.f. of gas, plus 15 BDPD, pay 2,382-92 ft. TD 2,468 ft.

Edlo-Texas Corp. 1-A A. C. Sparks, G. S. Sykes Sur. 88, 1 mile northwest of Fisk. IP 10,700 M.c.f. of gas, plus 35 BDPD, Jennings sand 2,381-2,418 ft. TD 2,433 ft.

Jones County: A. G. Hill 1 Daniel L. Cass, Sec. 35, Blk. 2, SPRR Sur., 9 miles southwest of Anson. IPP 146 BOPD, 42.6°, GOR 523:1, Swastika sand 3,225-34 ft. TD 3,296 ft.

Ambassador Oil Corp. 1 J. E. Touchstone, Sec. 9, Blk. 17, T&P Sur., 3 miles southwest of Truby. IPP 33 BOPD, 43°, GOR 460:1, Palo Pinto reef 4,114-20 ft. TD 4,128 ft., elevation 1,732 ft.

Nolan County: Ard Drilling Co. et al. 1 Ruth Harp Gibson, Sec. 12, Blk. X, T&P Sur., 10 miles south of Sweetwater, 1½ miles east of Lake Trammell field. IP 6,500 M.c.f. of gas, plus 36 BDPD, Strawn reef 5,664-68 ft. TD 5,862 ft., elevation 2,583 ft.

Palo Pinto County: Mid-Tex Gas Co. 1-B Will J. Belding, Sec. 5, Blk. 2, T&P Sur., 8 miles north of Brad. IP 1,600 M.c.f. of gas, conglomerate 4,118-26 ft. TD 4,230 ft. Shut-in pressure 1,400 psi.

Taylor County: Copaz Oil & Gas Corp. et al. 1 Miracle, Sec. 8, Blk. 3, SPRR Sur., 4 miles west of Tuscola. IP 176 BOPD, 16/64-in. choke, 39°, GOR 450:1, TP 80 psi., Flippen sand 2,537-45 ft. TD 2,750 ft.

Katz Oil Co. 1 O. D. Dillingham, Sec. 108, Blk. 64, H&TC Sur., 6 miles west of Bradshaw. IPP 113 BOPD, 38°, GOR 593:1, Upper Fry 4,416-20 ft. TD 5,000 ft.

TEXAS PANHANDLE

Lipscomb County: Irvin Producing Co. 1 Mrs. A. R. King, Sec. 679, Blk. 43, H&TC Sur., 11 miles west of Lipscomb, northwest part of county, 5 miles southwest of Tonkawa gas production at Kiowa Creek field, 5½ miles northeast of basal Morrow gas production in Merydith field. IPP 201 BOPD, 39°, Cleveland sand 7,330-50 ft.; IPCAOF 15,500 M.c.f.d. plus 9.2 bbl. cond. per million, upper Morrow sand 8,976-99 ft. TD 10,140 ft. Dual oil and gas discovery.

Petroleum Exploration, Inc., 1-20 Evins, Sec. 20, J. G. Grogan Sur., 7 miles north of Perryton, north-central part of county, 1 mile southeast of Dower field (Oklahoma), and 2 miles north of oil and gas production (Texas). IPF 340 BOPD, ½-in. choke, 37.1°, lower Morrow sand 8,195-8,218 ft. TD 8,360 ft. Oil discovery.

Do you know which engine mounting is best?

The Difference in Engine Mounting, Crosswise or Lengthwise, Can Save Thousands

Here are the facts to show why a Winchmobile with a cross mounted engine is superior!

Let's compare power efficiency . . . Because a Wilson Winchmobile with cross mounted engine will deliver *90% of the power* available at the converter output shaft *to the winch drum,* as compared to *only about 75%* in the usual *length mounted engine arrangement.*

With the usual "length mounted" engine arrangement there is 5% loss in the planetary gear section of the Fluid Transmission, then another 5% in the gear drive from the upper to the lower shaft; then 5% in the bevel gear drive, another 5% in the drive to the sand line drum shaft and finally another 5% in the drive to the hoisting drum. This is a total of 25% *at least,* probably more.

In the Wilson there are only two chain drives, one from the converter to the countershaft, and another from countershaft to the hoisting drum, with a loss of not over 10%.

If 150 Horsepower was available at the converter output shaft, on a Wilson 135 H. P. would be delivered to the drum, but on the competitive unit only 112½ H. P. The Wilson would then be *20% faster* than the competitive unit, $\left(\frac{135}{112.5} = 1.20\right)$ *with the same engine power!*

Why two speed drum drive! The Wilson Winchmobile has both a *high and a low speed friction clutch drum drive,* while most competitive units do not, and this will *take up the empty blocks faster,* and have *less wear on the drum drive.*

Here's a real trouble saver . . . The drive to the winch does *not go through the bevel gear box,* and the failure of these gears does not affect winch operation. There is less chance of trouble with these gears because they are only used when driving on the road, and on the rotary drive. And if they should fail, the unit can be pulled in to a repair shop by a truck or tractor, after the winch job has been completed.

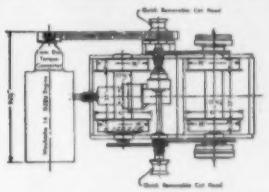
The best transmission . . . Wilson uses a standard four speed and reverse Brown-Lipe 8041 Transmission, which seldom gives any trouble and on which parts and service are available almost everywhere.

How many universal shafts? In the Wilson design only *one universal shaft* is used, whereas it is *usual to have three universal shafts,* two of which are in the winch drive system! There are *none in the Winch drive on the Wilson!* And these shafts require considerable maintenance.

There are some limitations on the type engines there are, of course, limitations on the engines that can be used if mounted crossways. The GM 6-71 Twin (12107) with Converter is over 9 ft. long. But either the *6-71 Single (6082),* the 110, or 12V-71, either with or without turbo supercharger can be used. The Cummins NHRBIS is within 8 feet. The Waukesha WAKBU is about 4" over 8' long, with converter, but in some places this is not objectionable. Smaller engines are available in a wide variety of makes and sizes. To mention only a few, there is the Waukesha 145-GZBU and 140, the International 501 and SOE V-549, also the ROIline SOE 540 and 844.

Less moving parts . . . by far: When a Wilson Winchmobile is in operation, servicing a well, there are some forty (40) less moving parts in action than with the usual competitive makes. Not only does this permit Wilson to deliver more horsepower to the drum, but greatly increases the life of the machine, with less opportunity for field breakdowns.

Big weight saving because of the elimination of so many parts, Wilson is able to reduce the weight several



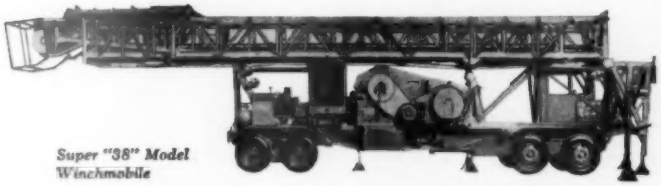
Top view of winch assembly showing drive arrangement.

thousand pounds under the competition. But Wilson has gone farther than this to eliminate excess weight. The truss-type frame and the aluminum clutch holding plates also reduce weight. All well servicing contractors are fighting weight restrictions. Wilson gives you a several thousand pound advantage.

And what about cost? After all, we are only talking about money! Since so many parts and so much weight have been eliminated, naturally a Wilson Winchmobile costs much less to buy, and much less to operate. A high trade-in may equal the dollar difference of what you pay originally for your winchmobile. But nothing can pay for hauling around several thousand extra pounds of dead weight, and operating a whole covey of extra moving parts, with the resultant fuel costs.

We almost forgot . . . a good reason the other folks don't build them with cross mounted engines, has something to do with the U. S. Patent Office. They take a dim view of such proceedings.

Right now, we are behind on orders for Winchmobiles, but we are booking orders for future delivery. See one of our dealers or salesmen now.



Super "38" Model Winchmobile

John W. Wilson

WILSON MANUFACTURING CO., INC.

Wilson

WICHITA FALLS, TEXAS

The Home of Rod Iron

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THAT WILL CHANGE
YOUR MIND!

FASTER PENETRATION FULL GAGE HOLE--

The new Reed Y bits have changed the concept of how fast a hole should be drilled. These Y bits have been setting impressive records in fast drilling all over the oil country. Advanced design, using special alloy steels combined with precision manufacturing, provides maximum rate of penetration—in a straight, full gage hole.

The ability to hold gage is a built-in feature in every Reed bit you buy. Continuing research, hard hitting engineering, modern metallurgy, and forty-two years experience have developed a bit that will hold gage all the way.

Ask the Reed man who calls on you to give you the full story. He'll convince you that the bit to buy—if you want faster penetration and a full gage hole—is the modern Reed Y bit.

REED ROLLER BIT COMPANY *Houston 1, Texas*

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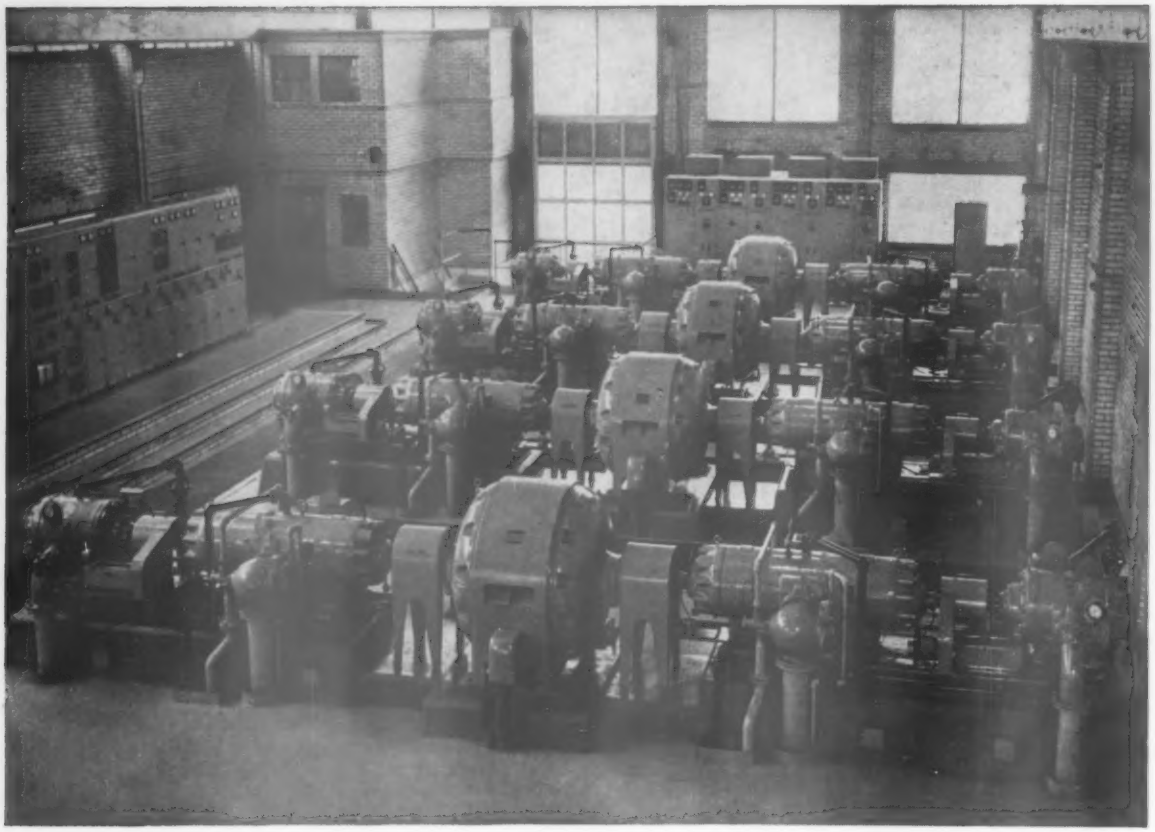
...and this is just the beginning!



Eight 1664 cfm Fuller rotary units compressing to 120 psig in tandem sets to four 700 hp electric motors. Compressor plant supplies 13,200 cfm load to oil refinery—for tools, machinery, air lines and other pneumatic uses.

HOW FULLER ROTARY COMPRESSORS SAVE SPACE – CUT OPERATING COSTS,... at major eastern refinery

To save valuable space in the compressor plant, a large eastern oil refinery installed eight two-stage Fuller rotary air compressors—using a unique drive system. Because of the simple direct-drive through flexible couplings permissible with Fuller rotaries, the refinery was able to drive dual sets of compressors by single, 700 hp. electric motors.

While this means savings in space, the rotaries are also operating with cost-cutting efficiency.

In more than two years of service, these rugged compressors have required no down-time for repairs!

Simple design, rugged construction and precision manufacture are the "secrets" of Fuller rotaries' dependability. The only moving parts are rotor, blades and bearings. There is no reciprocating action—hence no vibration. Smooth, quiet operation permits installation on light-weight foundations, on upper floors—saving in weight, bulk and cost of installation.

For full details on the maintenance-free economy and high performance of Fuller rotaries, write today for comprehensive, illustrated Bulletin C-5A.

C-343
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Selinger: Conservation Champ

● Skelly's conservation chief keeps on the go, a tireless proponent for workable laws to prevent oil waste.

THE MIGHTY MITE of oil proration has been a dash man all his life.

He's still sprinting, and thriving on it.

He skipped two grades in elementary school. He swung through a 4-year high school in 3 years. He played football as a pony back and boxed as a 90-lb. flyweight.

He proposed to his wife 2½ hours after meeting her. They were wed 35 days later.

Skelly Oil's George W. Selinger hasn't slowed the pace in 27 years of conservation work.

In a recent week, his business log ran like this:

Monday, fly to Austin, attend hearing, return to Tulsa.

Tuesday, fly to Santa Fe, participate in hearing, return to Tulsa.

Wednesday, fly to Wichita, meet with operators committee, return to Tulsa.

Thursday, drive to Oklahoma City, participate in hearing, return to Tulsa.

Gasping at the end of this bruising schedule? Not so. The man whose talents and skills have been drafted to help write the nation's conservation statutes, state by state, is just getting his second wind.

At least once every month now, he attends hearings on oil matters in 14 states and two Canadian provinces. No pleasure jaunts are these. He prepares papers on plane and train and participates actively in each get-together.

He is a familiar figure in statehouses. When he ambles into offices in Cheyenne or Baton Rouge or Helena or Topeka, like as not oil people will greet him first and begin swabbing him for information. He likes it. He's graciously swabbable.

Selinger is head of the Skelly Oil Co. conservation department, Tulsa. Preparing cases for regulatory agencies, railroad commissions and oil and gas boards is his meat.

Conservation born . . . His pattern for running a conservation department is exacting. Each week, his office checks the pulse of 17,000 wells in which his company has an interest.

"A conservation man's job," he says, "is to clear the way in advance for any state and regulatory operational requirements. "A conservation man can foresee rough spots and help meet them with the least amount of delay and unnecessary interference."

Conservation is second nature to Selinger. He was midwife when state conservation legislation was born. He's made a career of nursing oil laws to practical, workable maturity.

When the oil and gas conservation department of the Oklahoma Corporation Commission was established in 1932, Selinger was uprooted from a new law practice in Tulsa and drafted to take over in Oklahoma City as legal proration clerk.

In that first year, he helped write state-wide proration rules. The Oklahoma board's policing setup was considered the first in industry. Hearings on allowables and rules were held every day, 5 days a week.

Militia takes over . . . The natural rivalries of operators in the Seminole and Oklahoma City fields found sparks flying. Selinger had a good military arm helping enforce rules. The then Gov. William (Alfalfa Bill) Murray called the militia out frequently. The national guard saw that conservation laws were obeyed.

When he was 26, young Selinger rushed to Washington and appeared before the U. S. Supreme Court to argue that the proration tax was applicable to leases held by Osage Indians.

The Interstate Oil Compact was created in 1934. Selinger helped in state conferences before enactment of these laws and while state legislatures considered compact participation.

In 1935, with fledgling oil laws still being pummeled in courts, Selinger left his state post to go in business for himself. A year later he joined Skelly.

Consultant at-large . . . He has had a hand in writing and formulating oil and gas laws for Texas, Kansas, New Mexico, Arkansas, Nebraska, Illinois, Wyoming, Colorado, Louisiana, Mississippi, Utah, Montana, and North Dakota.

Two years ago, a delegation from Saskatchewan conferred with him in Tulsa on ways and means of establishing oil rules.

Selinger didn't set out in college to be a champion of oil conservation. The Seminole-Oklahoma City field hassle after graduation caromed him into it. He was born in 1908 in Liberty, N. Y., a Catskill-mountain town.

In 1912, his father moved the family to Tulsa. He was in the oil well supply business. George speeded through grade and high school and entered the University of Oklahoma in 1924. He graduated with a law degree in 1929, supplementing his law with engineering and geological courses.

He attended summer school 2 years at the University of Colorado, taking water and irrigation law subjects. Another summer before graduation, he went to Tulane University and specialized in French civil procedure. He returned to Tulsa for a year's law practice, then shifted to Oklahoma City and the start of his career as oil conservationist.

Early riser . . . Drop into his office

▶▶▶ Personals

and, like as not, you'll find Selinger in his shirt sleeves, poring over papers. He scribbles dates and times of hearings on a wall calendar.

He regularly arrives at his desk at 6:45 a.m. He isn't trying to get a raise or set a "shining example" to nudge his cohorts into extra effort.

"It's a good time of day to clear your desk, particularly when you're on the road so much," he says.

There are two sons in the family now. Keith, 20, a junior, is studying geology and engineering at the University of Tulsa. Douglas, 11, is in the sixth grade.

Selinger carries a telltale mark of his pugilistic days. He lost more fights than he won in high-school boxing, but never was knocked out. He emerged from one bout with a broken nose. The kink is barely noticeable.

"Recovery methods are changing and the whole oil picture is flexible —that makes conservation work interesting and stimulating," Selinger says. "Never, is it dull.

"There are golden opportunities right now, in my book, for the technical man and the trained man. Greater recoveries of oil, where we know oil now is, are a big challenge. The man with a sound background and a flare for the creative is worth his weight in gold."

●

D. D. Eley, district engineer in Wichita for Texaco Inc., has been transferred to Tulsa as division proration engineer.

William R. Evitt and **Peter H. Masson** have been named research associates in Jersey Production Research Co.'s geological research division.

E. K. Ketcham, vice president, refined sales, for Anderson-Prichard Oil Corp., has been named vice president in charge of marketing. Ketcham has been with the company 31 years.

Dr. Leonard E. Miller has been named research associate in organic chemistry at California Research Corp.'s Richmond, Calif., laboratory. Also at Richmond, **K. K. Macdonald** has been named senior staff assistant to the manager, general services, and **E. W. Mertens** has been appointed group supervisor in the fuel oils, asphalts, and special products division.

COOPER

W. R. Cooper, Arabian American Oil Co.'s general manager for engineering and construction, has been elected vice president in charge of engineering and construction. He succeeds **L. M. Snyder,** who is now vice president in charge of employe and public relations. Snyder is also in charge of local sales. Both will continue to headquarter in Dhahran, Saudi Arabia. A graduate of Yale University, Cooper joined Texaco Inc. in 1928. He moved to Aramco in 1944 to take charge of construction of the company's Ras Tanura refinery.

Ray B. McGuire, East Texas district superintendent for Tidewater Oil Co., has retired. McGuire joined Simms Oil Co. in 1919. It was purchased by Tidewater in 1935.

Lee M. Fuller, assistant treasurer of Sinclair Oil Corp., has been elected a vice president. He succeeds **Iver J. Bergholt,** who was recently named vice president and treasurer. Also, **J. P. Downer** has been named an assistant treasurer.

L. Glenn Moore, Vierson & Cochran, Oklahoma City, has been elected 1960 chairman of the central Oklahoma chapter of American Association of Oilwell Drilling Contractors. Other officers will be **Gene Bowman,** Big Chief Drilling Co., vice chairman, program; **Alvin S. Nuckolls,** Nuckolls-Bell Drilling Co., vice chairman, membership; **Fred McCown,** T. T. Eason & Co., secretary; and **B. D. McCampbell,** An-Son Drilling Co., treasurer.

J. A. Rogers, formerly chief geologist of the domestic producing department for Texaco Inc., has been named assistant New Orleans division manager. He succeeds **L. W. Calahan,** now Dallas division manager. **W. W. Moore,** New Orleans division geologist, has been transferred to the Houston division as assistant division manager. **R. B. Palmer,** assistant division geologist in Midland, Tex., will succeed Moore in New Orleans. Palmer will be succeeded by **R. E. Hunt,** geologist on the general manager's staff. **Kenneth E. Myron,** also geologist on the general manager's staff, has been promoted to staff geologist of the vice president's office, New York, domestic producing department.

D. F. Toomey, drilling engineer in Shell Oil Co.'s Denver area, has been named district mechanical engineer in Kilgore, Tex.

Dr. A. S. Ginzbarg, senior physicist in basic research at Shell Development Co.'s Houston exploration and production research laboratory, has been appointed manager of the physics and mechanics department at the lab.

Lauren G. Cable, field superintendent in charge of gas gathering in Falfurrias, Tex., for La Gloria Oil & Gas Co., has been named field superintendent in Louisiana's Rayne gas field for Texas Eastern Transmission Corp., the parent company.

Woodman (Woody) Perine, vice president of Vitro Corp. of America, has been named president and chief executive of Refinery Engineering Co. of Tulsa, a subsidiary. He succeeds **Thomas M. Lumly,** founder of Treco and its president since 1942. Lumly has resigned for reasons of health, but will continue as a director of Vitro

PERINE

LUMLY

Corp. and as a consultant to Treco. Perine has been with Vitro companies since 1948. He was president of Vitro Engineering Co. before becoming a vice president of the parent company. Lumly entered the industry as chief engineer of Kan-O-Tex Refining Co. He was later chief engineer of Cosden Petroleum Corp., and general manager of National Oil Proprietary, Ltd., in Australia. He organized Treco in 1942. The company was sold to Vitro Corp. in 1955. Lumly is recipient of the Richards Memorial Award which named him the outstanding U. S. mechanical engineer for a quarter of a century. He is a graduate of Oklahoma State University.

R. C. Faulkner, director of mechanical design and construction for Gulf Oil Corp. in Pittsburgh, has retired after 36 years with the company. Faulkner was general manager of the Port Arthur, Tex., refinery at one time and also served as Cincinnati refinery plant engineer and Toledo refinery assistant superintendent and superintendent.

▶▶▶ Personals

Robert A. Eeds, vice president and a director of Arabian American Oil Co., has been elected president and a director of Esso Standard (Libya) Inc., Libyan subsidiary of Standard Oil Co. (N. J.). Eeds succeeds **James A. Clark,** who has retired. **H. W. Brown,** a director and vice president of Esso Libya, has been named execu-

EEDS

BROWN

tive vice president, a new position. Eeds has had foreign assignments with Jersey affiliates since 1938 when he was with Standard-Vacuum Oil Co. in Sumatra. He was with Creole Petroleum Corp. in Venezuela before joining Aramco in 1950. Brown was assistant regional coordinator for Europe and North Africa in Jersey Standard's producing coordination department before moving to Esso Libya earlier this year. He is a former chief geophysicist, exploration manager, and director of Carter Oil Co.

Morris L. Carter has been named material-control planner foreman in the mechanical division at the Casper, Wyo., refinery of Standard Oil Co. (Ind.). He was formerly in the engineering department.

Frank Neighbor, Salt Lake City district geologist for Sun Oil Co., has been promoted to district exploration manager in Casper, Wyo. **John F. Harvey,** senior geologist in Salt Lake City, will succeed Neighbor.

Louis Mittelman, chief chemist at Tidewater Oil Co.'s Avon refinery, Associated, Calif., has been named superintendent of technology, control laboratories, and budget there. He has been with Tidewater at Avon since 1921. **Lewis A. Penn.,** assistant chief chemist, will succeed Mittelman as chief chemist.

Dr. R. R. Unterberger has been appointed a supervising research physicist in the well logging and basic producing research division of California Research Corp.'s La Habra, Calif., laboratory. Unterberger joined the company in 1950 as an experimental physicist. Also **N. J. Paterson** has been named group supervisor in the Richmond, Calif., laboratory's process planning division.

Richard E. DuVall, general superintendent of Peoples Natural Gas Co., has been elected vice president, operations. **Robert E. Seymour,** assistant to the president, has been named vice president, administrative.

William C. Hildebrand has been named vice president of Bay Petroleum Co. division of Tennessee Gas Transmission Co. Hildebrand is a former president of Processors, Inc., and was vice president of Gordon-Hildebrand, Inc., at one time.

J. D. Davis, assistant to the president of United Gas Corp., has been elected a vice president. Davis was western division pipeline superintendent for United Gas Pipe Line Co., a subsidiary, before being named assistant to the president of United Gas Corp. in 1957.

K. T. Smith, Pure Oil Co., has been elected president of Four Corners Geological Society. Other new officers are **Lee Kilgore,** Farmington, N. M., consultant, first vice president; **R. S. Agatson,** Atlantic Refining Co., second vice president; **Thomas Mayhew,** Shell Oil Co., secretary; and **W. E. Carr,** Durango, Colo., consultant, treasurer.

Bill Ramsey, plant foreman with Texaco Inc. at its Silvertip field, Wyoming, sulfur recovery plant, has joined Planet Engineers, Inc., Durango, Colo., as district superintendent in charge of gasoline plant and oil production for the Wyoming-Montana area.

William B. Maier, chief chemist for Sinclair Oil & Gas Co.'s gas and gas products department at Seminole, Okla., has been promoted to division superintendent, gas and gas products, Houston. He succeeds **Henry A. Witcher,** who was recently appointed superintendent of operations in the general office of the gas and gas products department, Tulsa.

Bert Edwards, controller of Carter Oil Co., has been named head of the tax department in the reorganized Humble Oil & Refining Co. **L. J. Weigle,** manager of Carter's southern division, will be secretary of Humble. Other new Humble officers will be **Lester R. Moore,** treasurer of Esso Standard Oil Co., who will be treasurer, and **Richard J. Gonzalez,** formerly treasurer and a director of Humble, to be coordinator of finance and economics. **Nelson Jones,** Humble general counsel, and **Oral L. Luper,** controller, will continue in these positions.

Myron R. Holmgren, president of River States Oil Co., marketing affiliate of Murphy Corp., has been elected a vice president of Murphy.

William R. Duncan has been appointed field superintendent for Well Completions, Inc., Denver. He has been in charge of the company's Texas Panhandle district since 1957.

Basil P. Kantzer, vice president and manager of Union Oil Co.'s Gulf division, has been elected vice president in charge of exploration and production in a major change of top Union operating personnel. Kantzer succeeds **Sam Grinsfelder,** who has retired after 37 years with Union. Also, **E. C. Babson,** manager of operations for the Canadian division, has been appointed manager of foreign operations. He will headquarter in Los Angeles. Grinsfelder, retiring vice president, will continue as a consultant to the company. He had been manager of Texas-Gulf operations before being named vice president in charge of field operations and exploration in 1946. In other changes, **K. C. Vaughn,** manager of the natural gas and gasoline department, will succeed Kantzer as manager of the Gulf division in Houston. Vaughn will be succeeded by **J. R. Fraser,** formerly assistant manager, natural gas and gasoline department. **E. W. Scott,** staff geological coordinator, has been named manager of the Canadian division, succeeding Babson in Calgary. **E. R. Atwill,** manager of operations in the West Texas division, has been transferred to Los Angeles on special assignment with the exploration department. **Ray A. Burke,** chief geologist for the Gulf division, will become manager of the West Texas division with headquarters at Midland.

KANTZER

John P. Purcell, formerly with DuPont Co.'s operations section in Wilmington, Del., has been named operations coordinator in the petroleum chemicals division eastern region office, New York. He succeeds **Robert B. Bothwell,** who has been transferred to Houston as sales service representative. **Richard R. Golding,** sales service representative in the north Jersey area, has been transferred to Wilmington as a technical asstant to the operations section.

Personals

W. W. Clawson, senior vice president and director in charge of exploration, producing, and research activities for Magnolia Petroleum Co., has been named manager of exploration for Mobil Oil Co., which has absorbed Magnolia's operations. He will headquarter in New York. A graduate of the University of Kansas, Clawson joined Magnolia in 1933. He was chief geologist for the company before being named manager of Socony-Vacuum Oil Co.'s Pegasus division in Billings, Mont., and president of Socony-Vacuum Exploration Co. in 1953. He later became president of Mobil Producing Co. In 1956 he was named coordinator of domestic production for Socony Mobil Oil Co. in New York. He moved to Dallas the next year as a director and vice president of Magnolia.

Alfons Landa, chairman of Reiter-Foster Oil Corp., and **Emil V. Hegyi,** president of Reiter-Foster, have been elected directors of Consolidated Royalty Oil Corp.

Bruce E. Thauburn, formerly in Arabian American Oil Co.'s New York economics department, has joined Ohio Oil Co. as staff assistant to the manager, crude-oil purchase and sales department. He will headquarter in Findlay, Ohio.

Ahmad Kamil al-Badri, assistant under secretary in the United Arab Republic ministry of industry, has been appointed managing director and general manager of the UAR's general petroleum authority. He replaces the late Salah Nasim, who was killed this summer in an automobile accident.

Buel L. Dowden, terminal foreman at Texas Eastern Transmission Corp.'s McRae, Ark., products terminal, has been named assistant district foreman at the El Dorado, Ark., products terminal. **Leo E. Malone,** terminal foreman in Chicago, has been transferred to the Seymour, Ind., products terminal as assistant district foreman. **Elbert R. Martin,** formerly with Gulf Refining Co., has been named terminal supervisor of the LPG underground storage terminal at Mont Belvieu, Tex.

H. G. Corneil has been named research associate in Humble Oil & Refining Co.'s research and development division, Baytown, Tex.

J. A. Saunders, production superintendent for Frankfort Oil Co., has been transferred to Amarillo, Tex., from Norman, Okla.

Robert G. McCuistion, seismic party chief with Empire Geophysical, Inc., has been promoted to supervisor. He will headquarter in Midland, Tex. A graduate of Louisiana Polytechnic Institute, McCuistion was with Seismic Explorations, Inc., before joining Empire Geophysical in 1955.

G. J. Hamilton, Saskatchewan district geologist for Royalite Oil Co., Ltd., has been named chief geologist for the company. **R. S. Phillips** has been appointed field superintendent for Turner Valley operations. He was formerly Coleville field superintendent.

Merwin Bristol, associate general counsel for Standard Oil Co. (Ind.), has been elected general counsel and a director of the company. He succeeds **Thomas E. Sunderland,** who has resigned to become president and chief executive officer of United Fruit Co. **Richard J. Farrell,** assistant general counsel, will succeed Bristol as associate general counsel. The appointments are effective November 1.

Graham B. Knight, formerly vice president of J. R. Minevitch & Associates, Inc., Boston process engineering firm, has formed Advanced Technology Associates, consulting company in San Antonio, Tex.

Dr. R. H. Nanz, manager of the geological department at Shell Oil Co.'s Houston exploration and production research laboratory, has been appointed director of exploration research, exploration and production research division. **F. T. Connolly,** senior geologist, Houston, will succeed Nanz.

Christy Payne, Jr., vice president of Peoples Natural Gas Co., received the distinguished service award, highest honor of American Gas Association, at AGA's convention last week in Chicago. The award is presented annually to the person making the most outstanding contribution to the general interest of the gas industry.

H. F. Tomfohrde, manager of Tidewater Oil Co.'s eastern division transportation and supply department, has been named transportation manager in the Los Angeles home office. Tomfohrde has been with Tidewater since 1929. He had been assistant to the manufacturing vice president, assistant to the division general manager, and eastern division lubricants supply manager before becoming division transportation manager in 1957.

Deaths

C. E. (Gene) Davis, 60, former vice president in charge of manufacturing for Shell Oil Co., died October 1 at his Kirkwood, Mo., home after a heart attack. Davis was general secretary of last summer's Fifth World Petroleum Congress in New York. He entered the oil business in 1917 with Shell and was named manufacturing vice president in 1945. In 1951 Davis joined Petroleum Administration for Defense, which he served as refining division director and associate deputy administrator.

J. O. C. Brown, 63, vice president of Petro-Tex Chemical Corp., died October 2 in a Houston hospital. Brown became a vice president of Petro-Tex in 1955 when the company was formed by Sinclair Refining Co. and Tennessee Gas Transmission Co. to operate a Houston butadiene plant, formerly owned by the Government. Brown was general superintendent and manager of the plant when it was operated by Sinclair for the Government.

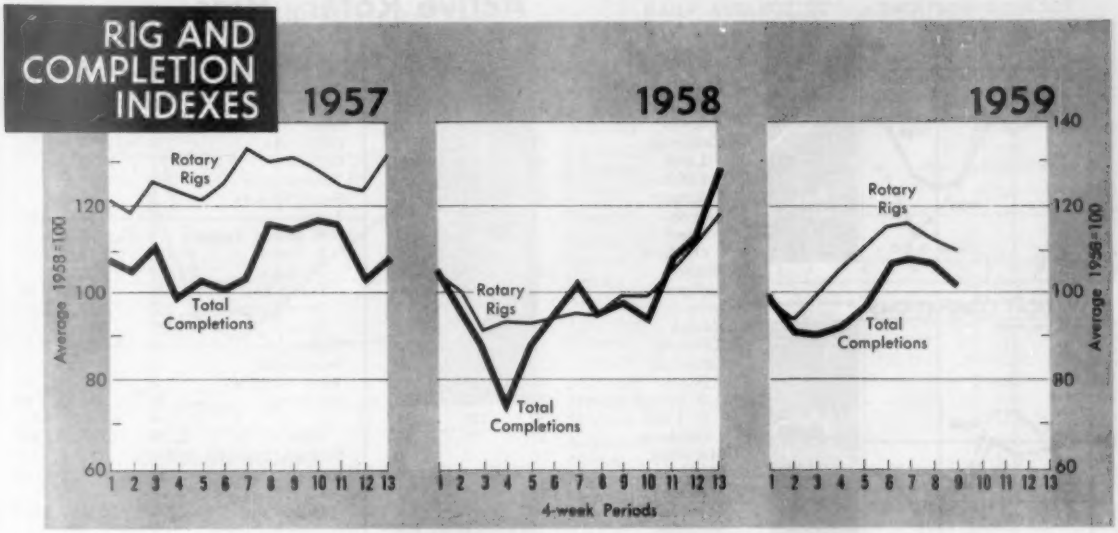
Frederick George Treutle, 54, Wichita independent operator, died October 1 while on a tour of Hawaii. A graduate of the University of Washington, Treutle had been an independent operator since 1941.

Jeff D. Roberts, Sr., 77, retired chief driller for Layne Texas Co., Inc., died October 4 at his home in Houston. Roberts joined Layne Texas in 1915. He retired in 1947.

Harold C. Caywood, 50, owner of Caywood Drilling Co., Casper, Wyo., died recently in a Casper hospital after a long illness.

Thomas A. J. Dockweiler, 67, Los Angeles attorney and civic leader and a director of Skelly Oil Co. and Mission Corp., died recently at his Los Angeles home.

BY JOHN C. CASPER



Drilling upturn

may depend on pipe

WELL COMPLETIONS will not climb as fast in the last quarter as they did last year. The charts on this page and the latest weekly completion table on page 260 indicate an upturn for the remaining weeks of the year, but without the spectacular increases of last year.

Total completions showed a gain for the week ended October 3, up 26 wells to 971. The week's total was 72 wells above the 899 reported for the corresponding week of 1958. The big jump last year came about the middle of October, resulting in an average of 1,108 wells per week for the last 11 weeks of the year.

Operators are using more rotary rigs than at this time last year. According to the Hughes Tool Co. report (page 260), there were 2,139 rotary rigs operating for the week ended October 5. For the corresponding week last year, the total was 1,898 rigs. This means operators have about 240 more rotary rigs turning than at this time last year.

There was a steady gain in rigs operating during the last quarter of 1958, but reports for the period indicate that the total did not reach 2,138 until the week ended November 24.

The important difference between last year's rig record for early October and the current reports is in the outlook for coming weeks. Last year, there was a very sharp climb both in number of rotary rigs operating and well completions. This year plans are uncertain.

Most of the steel for drilling in the third quarter this year came out of stocks, and operators' stocks are shrinking. Completions for the fourth quarter will depend on steel availability. Operators' plans, reported at midyear, indicated they wanted to drill almost 27,600 wells in the last half. They had completed only 13,464 wells of this last-half program by October 3.

To complete the last-half program would call for 14,000 more wells between now and the end of the year. That would mean an average of 1,077 wells per week. Can it be done?

Last year, total completions reported for the last 13 weeks of the year amounted to 14,024 wells, just about the total needed to complete this year's program.

Operating rotary rigs averaged 2,117 for the last 13 weeks of 1958 compared with 2,139 for the week ended October 5 this year.

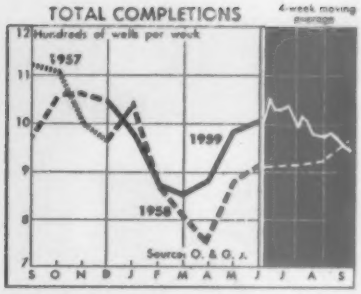
But these figures give no consideration to two important factors. First, steel may not be available for 14,000 wells. Operators may not have enough pipe to keep 2,139 rotary rigs running for the remainder of the year.

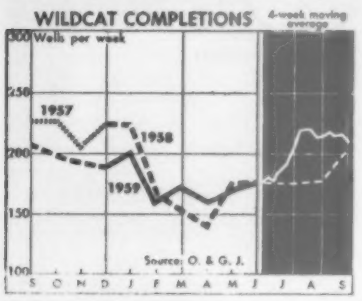
Also, last year's total included an abnormal number of shallow cable-tool wells in Kentucky and Oklahoma. More wells were reported for Kentucky in the last 3 months of the year than for the first 9 months. Shallow drilling has slowed down this year. It will not swell the last-quarter drilling total as it did in 1958.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,832,090	DOWN	21,340	DOWN	190,060
Crude stocks	250,310,000	UP	122,000	UP	2,265,000
Completions	970	UP	25	UP	71
Refinery runs	7,618,000	DOWN	104,000	UP	111,000
Gasoline stocks	175,857,000	DOWN	5,039,000	UP	3,275,000
Kerosine stocks	32,231,000	UP	14,000	UP	914,000
Distillate stocks	174,169,000	UP	1,768,000	UP	17,641,000
Residual stocks	59,524,000	UP	126,000	DOWN	9,218,000
Four-product stocks	441,781,000	DOWN	3,131,000	UP	12,612,000
Total imports	1,960,900	UP	307,800	UP	240,200

DRILLING





Active Rotary Rigs

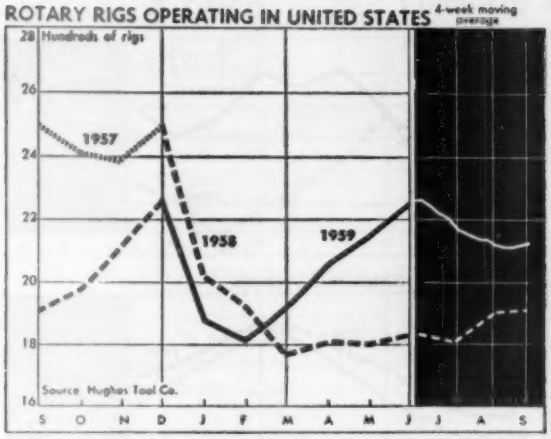
	10-5-59	9-28-59	10-6-58
Alabama	5	8	7
Arkansas	19	15	25
Arizona	1	2	2
California	88	86	73
Land	84	83	(*)
Offshore	4	3	(*)
Colorado	60	52	41
Florida	2	2	1
Land	2	2	1
Offshore	0	0	0
Illinois	35	45	51
Indiana	9	8	10
Iowa	1	1	3
Kansas	148	139	142
Kentucky	11	8	4
Louisiana	329	326	299
North	47	29	27
S. Inland waters	117	121	(†)
S. Land	110	120	235
Offshore	55	56	37
Maryland	0	0	0
Michigan	37	35	10
Mississippi	79	87	51
Missouri	0	0	1
Montana	31	26	23
Nebraska	24	25	21
Nevada	1	1	0
New Mexico	101	115	92
New York	0	0	2
North Dakota	20	24	32
Ohio	5	5	0
Oklahoma	214	220	212
Oregon	0	0	0
Pennsylvania	10	8	9
South Dakota	8	7	3
Texas	766	764	670
S. Inland waters	6	5	(†)
S. Land	188	193	135
Offshore	0	0	1
North-East	183	176	167
West Central	237	244	212
West	152	146	155
Utah	32	29	31
Washington	2	2	1
West Virginia	8	5	2
Wyoming	93	94	63
Total U. S.	**2,139**	2,139	1,881
Western Canada	174	181	137
Eastern Canada	1	1	4
Grand total	2,314	2,321	2,022

Hughes Tool Co. report. *Comparisons not available due to change in method of reporting. †Included in South-Land.

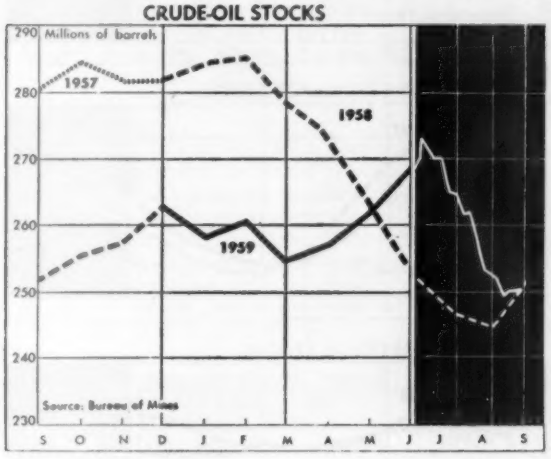
WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 3, 1959

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	2	2	0	0	0	0	23,062	77	59	0	0	0	0	0	20	23
Arkansas	26	20	0	1	5	0	89,319	632	578	5	0	0	1	4	112	122
California	28	10	0	1	16	1	123,758	1,140	1,175	14	0	0	1	13	301	281
Colorado	15	3	0	2	10	0	80,695	579	622	7	1	0	0	6	343	359
Illinois	50	13	0	0	13	24	116,830	1,713	1,706	3	0	0	0	3	287	346
Indiana	0	0	0	0	0	0	0	621	600	0	0	0	0	0	212	218
Kansas	56	19	0	1	35	1	196,168	3,006	2,883	17	1	0	0	16	755	605
Kentucky	68	20	0	15	32	1	116,813	1,836	880	18	0	0	0	18	211	114
Louisiana	108	46	18	5	39	0	850,499	2,827	2,606	11	0	0	0	11	378	384
North	39	20	0	5	14	0	112,995	1,084	976	5	0	0	0	5	167	164
South	56	21	14	0	21	0	602,308	1,433	1,295	6	0	0	0	6	197	197
Offshore	13	5	4	0	4	0	135,196	310	335	0	0	0	0	0	14	23
Michigan	0	0	0	0	0	0	0	472	323	0	0	0	0	0	120	103
Mississippi	12	5	0	0	7	0	125,368	482	291	6	0	0	0	6	214	136
Montana	5	2	0	1	2	0	29,246	242	253	3	1	0	0	2	78	101
Nebraska	18	5	0	0	13	0	97,707	690	536	9	1	0	0	8	297	251
New Mexico	54	25	2	13	9	5	205,629	1,570	1,472	6	0	0	0	6	182	204
Northwest	28	7	2	13	4	2	106,173	709	714	2	0	0	0	2	49	86
Southeast	26	18	0	0	5	3	99,492	861	758	4	0	0	0	4	133	118
New York	19	12	0	0	0	7	24,572	214	418	0	0	0	0	0	18	39
North Dakota	6	3	0	0	3	0	43,911	357	342	0	0	0	0	0	67	111
Ohio	16	4	0	6	2	4	36,370	752	774	0	0	0	0	0	23	12
Oklahoma	113	52	2	13	45	1	439,638	4,300	4,852	19	1	1	4	13	658	666
Pennsylvania	0	0	0	0	0	0	0	392	438	0	0	0	0	0	10	14
Texas	335	191	11	5	121	7	1,345,349	14,249	13,614	67	0	0	0	67	2,689	2,797
Dist. 1	35	17	0	0	18	0	106,512	815	743	15	0	0	0	15	241	296
Dist. 2	9	3	2	0	4	0	73,985	592	572	1	0	0	0	1	174	155
Dist. 3	21	7	3	0	11	0	143,359	908	968	4	0	0	0	4	184	217
Dist. 4	21	6	2	2	11	0	127,512	1,013	896	5	0	0	0	5	252	267
East	31	17	2	0	12	0	106,451	937	943	6	0	0	0	6	181	261
Dist. 7-B	49	24	0	1	24	0	122,129	1,966	1,856	17	0	0	0	17	525	522
West	90	68	0	1	17	4	412,750	4,359	3,914	10	0	0	0	10	600	553
Dist. 9	52	31	0	1	17	3	122,766	2,669	2,740	4	0	0	0	4	448	439
Dist. 10	27	18	2	0	7	0	129,885	990	982	5	0	0	0	5	84	87
Utah	4	2	0	0	2	0	17,999	237	289	1	0	0	0	1	63	64
West Virginia	10	1	0	8	1	0	27,336	587	564	0	0	0	0	0	24	14
Wyoming	16	6	0	2	5	3	63,558	743	572	6	1	0	1	4	256	172
Misc. (Ariz., Ore., Tenn.)	10	1	0	0	9	0	21,930	113	70	8	0	0	0	8	76	60
Total U. S.	**971**	442	33	73	369	54	4,075,757	37,831	35,917	**200**	6	1	7	186	7,394	7,196
Previous week	945	397	26	54	414	54	4,042,289	.....	.....	211	19	0	5	187	.....	.....
Cum. 1959	37,831	18,852	934	2,769	14,241	1,035	157,605,456	.....	.....	7,394	674	91	236	6,393	.....	.....
Cum. 1958	35,917	17,518	867	2,732	13,847	953	148,351,340	.....	.....	7,196	705	124	201	6,166	.....	.....
Western Canada	40	23	0	7	10	0	215,238	1,831	1,863	11	2	0	3	6	515	505
Ontario	0	0	0	0	0	0	0	186	.....	.....	.....	.....	.....	.....	.....	.....

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	9-26-59	9-19-59	9-27-58
Pennsylvania	2,646	2,659	2,828
Other Appalachian	2,112	2,091	1,406
Illinois, Indiana, Michigan	9,752	9,643	10,119
Nebraska and North Dakota	2,818	2,865	2,283
Kansas	10,070	10,206	9,350
Oklahoma	14,456	13,967	16,190
Arkansas	2,264	2,147	1,752
Louisiana	17,507	18,552	16,302
North	3,375	3,518	2,821
South	14,132	15,034	13,481
Mississippi, Alabama, Florida	2,472	2,576	2,677
New Mexico	7,964	7,687	7,924
Texas	106,742	107,468	105,627
East Texas	8,281	8,963	7,837
West Texas	49,354	49,943	52,476
Texas Gulf	19,034	18,437	19,322
Other Texas	30,073	30,125	25,992
Wyoming	16,137	15,990	13,562
Other Rocky Mountain	9,272	9,298	9,113
California	29,561	29,749	33,947
Foreign	†16,447	15,290	14,965
Total	**250,310**	250,188	248,045

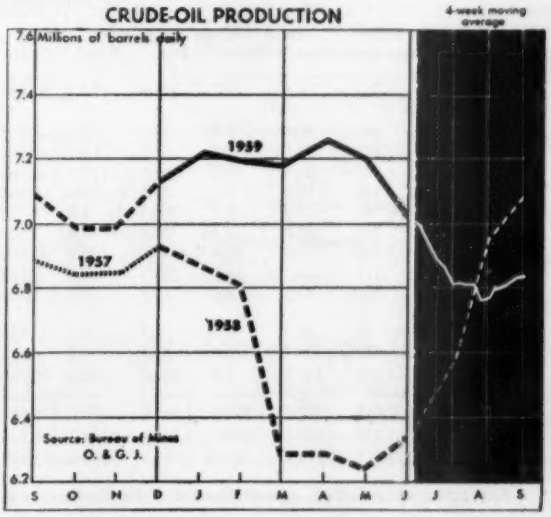
*Bureau of Mines. †Includes 4,338,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

	October 3, 1959			Sept. 26
	Crude oil	Lease condensate	Total	total
Alabama	15,800		15,800	15,600
Arkansas	47,450	250	47,700	46,500
California	837,200		837,200	838,700
Colorado	126,900		126,900	126,600
Eastern	40,900		40,900	40,000
Florida	1,150		1,150	1,200
Illinois	221,500		221,500	219,700
Indiana	31,000		31,000	30,800
Kansas	†315,000		†315,000	†318,280
Kentucky	84,100		84,100	81,600
Louisiana	912,000	107,450	1,019,450	997,750
North	108,000	5,200	113,200	113,000
South	804,000	102,250	906,250	884,750
Michigan	29,600		29,600	29,500
Mississippi	137,630	4,100	141,730	141,570
Montana	82,300		82,300	82,000
Nebraska	67,300		67,300	65,900
Nevada	100		100	100
New Mexico	287,200	5,200	292,400	290,900
North Dakota	52,100		52,100	50,400
Oklahoma	†485,100		†485,100	†517,900
Texas	2,410,000	75,600	2,485,600	2,500,020
Dist. 1	42,000	2,500	44,500	44,000
Dist. 2	102,000	7,700	109,700	110,600
Dist. 3	314,000	37,000	351,000	350,800
Dist. 4	170,000	8,600	178,600	178,200
Dist. 5	27,000	300	27,300	28,800
Dist. 6	103,000	9,000	112,000	111,200
East Texas field	130,000		130,000	132,500
Dist. 7-B	132,000	175	132,175	132,600
Dist. 7-C	115,000	3,225	118,225	118,020
Dist. 8	968,000	4,500	972,500	979,200
Dist. 9	200,000	1,600	201,600	203,600
Dist. 10	107,000	1,000	108,000	110,500
Utah	108,000		108,000	110,800
Wyoming	346,800		346,800	347,300
Others	‡360		‡360	‡310
Total U. S.	6,639,490	192,600	**6,832,090**	6,853,430
Change from prev. week down			**21,340**	
Canada	†566,600		†566,600	†592,000
Total U. S. Prod.—Jan. 1-Oct. 3				1,949,028,270 bbl.
Same period last year (crude plus cond.)				*1,823,049,440 bbl.

*Includes 43,497,580 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington.

CRUDE-OIL PRODUCTION



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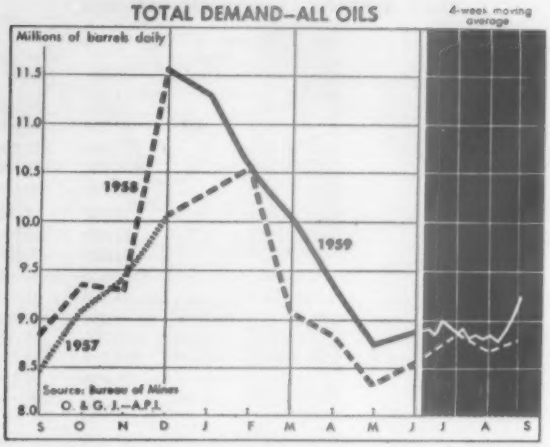
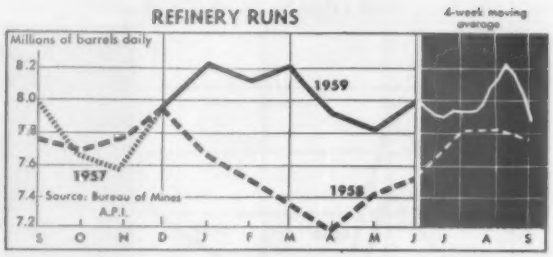
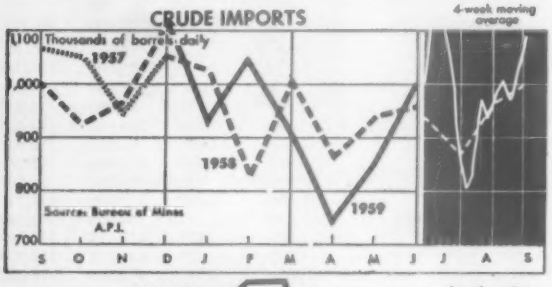
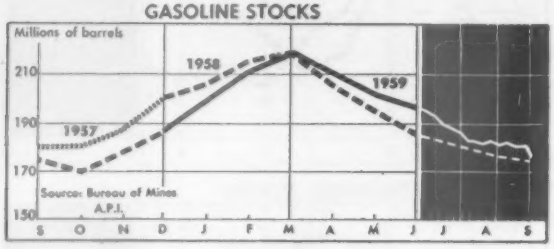
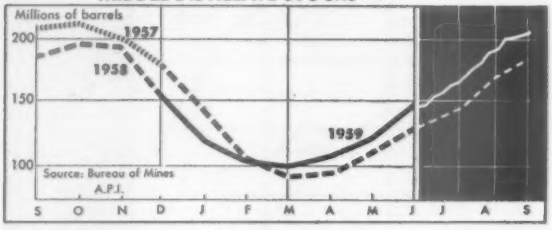
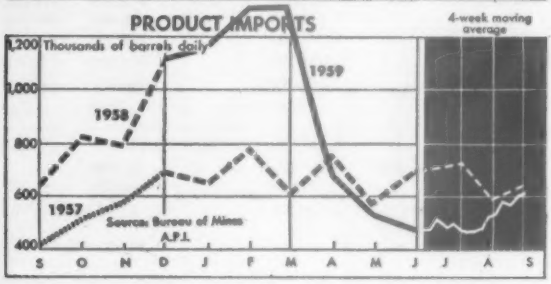


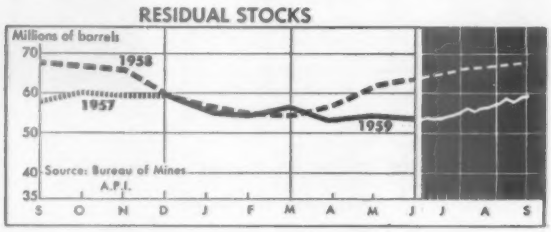












API REFINERY REPORT—OCTOBER 2, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1958: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,042	519.6	29.7	344.6	150.6	41,646	13,174	68,304	12,513	1,071	483.9	25.4	326.5	152.6
Appalachian:														
District 1	91	39.3	2.3	19.3	4.7	5,317	649	4,515	391	102	42.5	4.2	21.9	9.5
District 2	103	51.6	8.4	17.7	8.3	2,611	552	1,807	484	103	49.9	6.0	18.2	13.6
Ind., Ill., Ky. ...	1,405	786.3	69.3	281.8	147.7	30,788	7,527	28,634	6,352	1,363	702.7	59.7	287.6	142.0
Minn., Wis., Dak.	106	51.1	4.6	29.3	11.4	6,364	1,425	8,275	479	60	25.8	3.3	15.4	8.2
Okla., Kans., Mo.	740	413.4	17.4	186.9	24.3	16,720	1,579	12,669	909	667	373.4	11.6	163.2	24.7
Inland Texas ...	232	197.0	8.4	41.0	19.4	7,022	578	1,711	2,317	281	197.6	8.4	50.6	23.6
Texas Gulf Coast	1,656	875.4	85.4	449.0	108.7	20,268	3,212	20,229	6,457	1,845	958.0	119.3	504.4	199.9
La. Gulf Coast .	711	386.3	58.9	183.3	50.9	9,168	1,903	7,738	1,547	676	378.5	60.6	164.4	45.6
N. La. and Ark..	70	42.9	4.0	15.6	5.3	5,188	871	2,194	240	97	42.0	6.1	21.5	6.6
Rocky Mountain:														
New Mexico:.	27	18.4	0.7	4.7	3.3	790	51	160	44	23	12.1	0	4.6	2.4
Other Rky. Mt.	307	144.7	5.0	61.1	34.7	4,435	366	2,880	1,324	276	129.4	3.2	65.2	33.0
West Coast	1,128	551.7	5.9	170.7	262.8	25,540	344	15,053	26,467	1,136	504.2	7.6	174.9	297.4
Oct. 2, 1959....	7,618	4,077.7	300.0	1,805.0	832.1	175,857	32,231	174,169	59,524	7,700	3,900.0	315.4	1,818.4	959.1
Sept. 25, 1959..	7,722	4,011.1	279.1	1,736.4	904.7	180,896	32,217	172,401	59,398	.....	.....	.....	.....	.....
Oct. 3, 1958	7,507	3,651.9	247.1	1,753.7	958.4	172,582	31,317	156,528	68,742	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Group 3 price slide halted

GASOLINE PRICES may have bottomed out in the Group 3 area. The trend is not so much a firming of the market as it is the realization that regular gasoline prices will have to be near 11.00 cents a gallon if the refiner wants to stay in business.

The current spot price for unbranded regular gasoline of 11.00 cents a gallon may be the bottom of a skid that started early in September. There have been two prior depressions in gasoline prices on the Group 3 market so far this year. The first was in February with a low of about 11.25 cents. This was followed by a price rise during the spring months that lasted until about May. The second low came in the first week of July when spot regular dropped as low as 10.875 cents a gallon.

Some spot sellers who have been quoting prices under the formal posting for Group 3 regular did not follow the latest cut in formal quotations. The result was a leveling off at 11.00 cents. Regular gasoline sold for 11.00 cents back in the early part of 1956, but that gasoline was 86 octane compared with 91 octane at the present time.

No. 2 fuel price probably will move up 0.25 cent on the Group 3 market by the time this issue is received by subscribers. The general spot price for northern shipment has been 8.00 cents a gallon, but unconfirmed reports indicate at least one supplier has notified his customers that his price has been raised to 8.25 cents. Another supplier is reported to have discontinued a low summer price to a reseller. Since the price to the reseller is up to 11.00 cents for No. 2 fuel, the price to the distributor will be about 11.25 cents.

Quotations are unchanged for both gasoline and light fuel on the Gulf Coast. However, gasoline prices probably could be shaded 0.25 cent for loading in the last half of the month.

Gulf Coast refiners are not offering any No. 2 fuel for less than 8.125 cents, but current stock reports show that some will be short on clean storage space if cold weather comes late this fall.

Market reports from the New York area show widespread discounting on distillate sales. These discounts will disappear if winter comes early. They will shift from discounts to lower formal postings if the weather remains warm through November.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill§ Calif.	Oklahoma	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 9-12-59.

§Union Oil Co. of California posting up to 25c less per barrel.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.95
West Virginia	3.77
Buckeye Grade	3.62
Illinois Basin	**3.00**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	11.00-11.25
Premium (99 octane)	13.75-14.00
Natural gasoline (26-70)	4.5
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.75
Regular (92 octane)	11.00
Premium (98 octane)	12.25
California (rack) (Los Angeles):	
Regular (88 octane)	11.65-12.25
Premium (94 octane)	12.65-13.25
Premium (100 octane)	14.15-14.50
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.00

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.00-9.50
Diesel oil (58 d.i. and above)	8.75-9.25
Distillate No. 1	8.75-9.25
Distillate No. 2	8.00-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	8.625
Distillate No. 2	8.125
New York Harbor (barges):	
Kerosine 41-43	9.60
Distillate No. 2	9.10
Diesel fuel, 48-52 d.i.	9.40
Caribbean area (cargoes):	
Distillate No. 2	8.125

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.40-1.60
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
★ Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

Gulf-USNH, dirty (ATRS—32.5%)	$1.92
★ Carib.-USNH, dirty (ATRS—50%)	1.38
★ PG-USNH, dirty (USMC—70%)	3.81

★ Denotes change from previous week.

SELECTED MONTHLY DATA

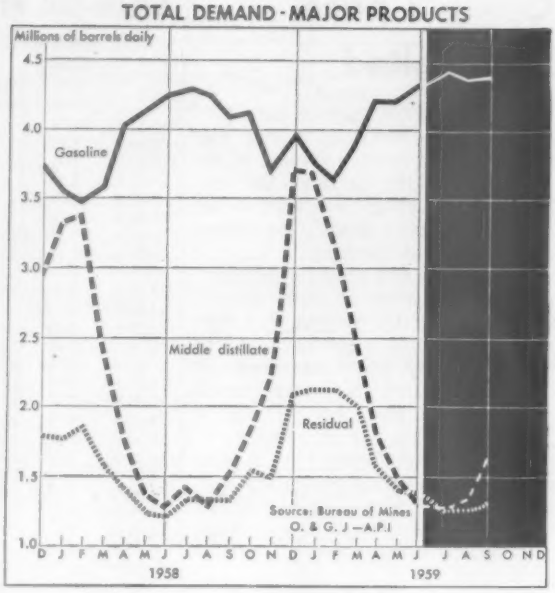
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

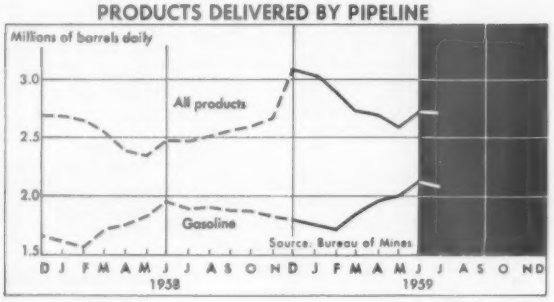
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
September 1959*	4,400	4,130	176,600
August 1959*	4,380	4,175	182,000
July 1959	4,490	4,076	185,294
October 1958	4,112	3,921	170,120
September 1958	4,097	4,000	175,337
KEROSINE			
September 1959*	250	285	32,200
August 1959*	210	270	31,200
July 1959	197	225	28,328
October 1958	299	315	31,877
September 1958	203	285	31,259
DISTILLATE			
September 1959*	1,400	1,760	173,900
August 1959*	1,120	1,800	161,600
July 1959	1,131	1,719	140,388
October 1958	1,562	1,818	164,686
September 1958	1,321	1,784	155,412
RESIDUAL			
September 1959	1,310	875	59,500
August 1959*	1,270	885	57,000
July 1959	1,232	823	54,509
October 1958	1,533	959	67,045
September 1958	1,328	973	67,670

*Preliminary. †Thousands of barrels.

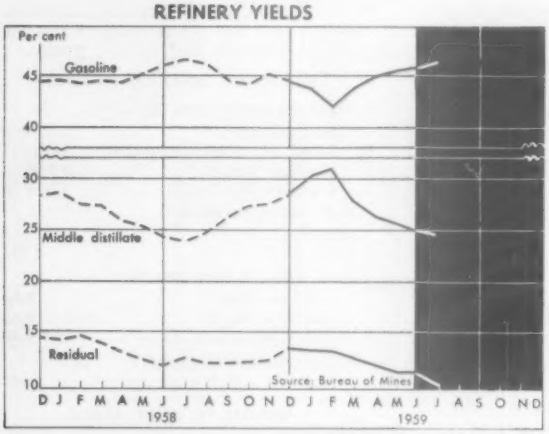
TOTAL DEMAND - MAJOR PRODUCTS



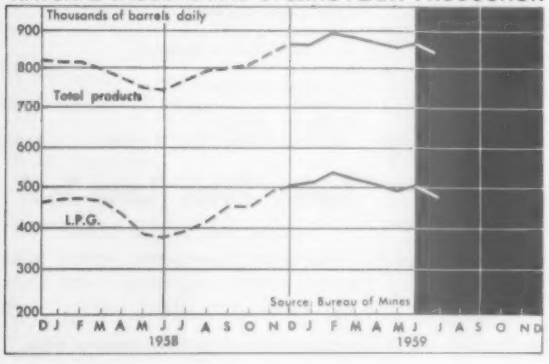
PRODUCTS DELIVERED BY PIPELINE



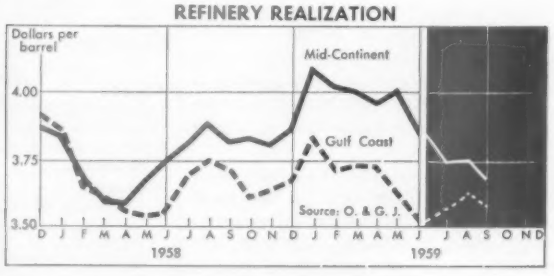
REFINERY YIELDS



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	Sept.* 1959	Aug.* 1959	July 1959	Sept. 1958
Mid-Continent	$3.67	$3.76	$3.72	$3.82
Gulf Coast	3.58	3.64	3.63	3.71

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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WALKER-NEER S-31 Spudder, complete with truck, tools, and equipment. Top condition. $10,000.00. Yost Oil Company, Box 31, Colorado City, Texas. Phone RA 8-3658.

NATIONAL T-25 rotary drilling rig with General Motors Twin 6 Diesel Engines, 97 foot Lee C. Moore derrick and 7¼ x 14 Garner Denver Slush Pump, with complete equipment, with or without drill pipe.

FRANKS COMET rotary drilling rig, Model 658-TRD trailer mounted with 84 foot telescoping derrick drawworks, powered by GMC 6-110 Diesel Engines and torque converter, with 7½ x 12 Gardner Denver Slush pump, with or without drill pipe.

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5—8" bore 108" stroke, flange mount
1—4" bore 8½" stroke, 2000 PSI, flange mount
2—6" bore 23" stroke, 2000 PSI, double ended
3—4" bore 3⅝" stroke, 2000 PSI, flange mount
6—5½" bore 7" stroke, 2000 PSI, flange mount
3—5" bore 2¾" stroke, 2000 PSI, flange mount
6—7" bore 3" stroke, 2000 PSI, flange mount

COMMERCIAL SHEARING CYLINDERS—NEW

2—Telescoping 60" stroke, Chrome Plate Sleeves 1½ N.P.T.

GARDNER DENVER MUD PUMPS—NEW

1—5" x 12" Cast Steel, Fluid Ends Only
2—5" x 12" Alloy Iron Mud Pumps

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— TOP GRADE EQUIPMENT —

AT HOBBS, NEW MEXICO

3,658 ft.	9⅝" 47#	N-80	Csg.
123 ft.	13⅜" 61#		Csg.
10,621 ft.	2⅜" J55	E.U.E.	Tbg.
6,002 ft.	3" 7.70#	Line Pipe	

1—Xmas Tree O.C.T. Bought This Year. 7" x 2⅜" with 13⅜" Csg. Hd. and 9⅝" Csg. Spool. 1000#-5000# WP.

1—Used High Pressure Separator and Meter Run With Misc. Fittings.

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5,935 ft. 5" 18# N-80 Hydrill. Csg.
3,312 ft. 2⅜" J55 E.U.E.

All Tubulars Threaded and Coupled Run Only Once.

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36" x 70' OVERALL LEBLOND COMBINATION OIL FIELD TURNING THREADING, BORING & TREPANNING LATHE (CAN BE USED AS A 25' CC LATHE).

Built 1941. Used in gov. arsenal only. Excel. condition. 16" hole in spindle, 30" chuck, 8" boring bar, 25' max. cap. Two carriages with tapers. 40-30-7½-5 HP motors. Replacement value $150,000. Terms. 90 day return guarantee.

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FOR SALE—133' IDECO Full View Portable Mast, 9' Substructure, Wilson Giant single drum drawworks, complete with two engine compound, Oilwell 20½" rotary table with torque converter, 7½ x 16 Bethlehem G-300 Pump. Excellent condition guaranteed. Kirkpatrick Oil Co., 1300 N. Broadway, Oklahoma City, Phone CE 9-1416.

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- 20 Towers 2'6" to 16' dia. x 20' to 145', up to 300 psi.
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- 250 Heat Exchangers and Condensers 7,500 to 100 sq. ft.
- 20 Reboilers 2,700 to 450 sq. ft.
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500,000 ft. 10¾" O.D. 35#
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3600' 5" OD x 18# Hyd Flush Jt., Rg. 2, Used	1.75 ft.
705' 9⅝" x 40#, N-80, LT&C, Smls, Prime, API, New	4.60 ft.
4080' 2⅜" x 4.70# EUE Acme 6 Th, Tested and drifted, A-1, Used	.45 ft.
6202' 2⅞" x 8.8# EUE Acme 6 Th, Used	.50 ft.
15000' ¾" Kobe EUE Tubing, Used	.27 ft.
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New, Prime, API Monogrammed

4½" x 9.5#, ST&C, Rg. 2, Seamless	1.085 ft.
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All standard sizes tubing, casing, and sucker rods
Tanks, surface equipment, and pumping units
1—Nat'l. Type E-24-228D, 15 mos. old
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- 5—B&W BOILERS, 70,000 #/hr. 500 PSI. (1952)
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- 5—FURNACES 11.4 MM to 15 MM BTU per hour
- 150 CENTRIFUGAL, HOT OIL and STEAM PUMPS
- 2—CARRIER CENTRIFUGAL COMPRESSORS, 38,300 CFM and 9,370 CFM with 3,370 HP and 2,310 HP TURBINES
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Sidney, Nebraska
"Quitting Business"

TUESDAY, OCTOBER 27, 1959
10:00 A.M. (MST)

Registration Beginning at 9:00
Inspection Starting Oct. 20

Panhandle Oilwell Service Co. is going out of business and has commissioned Wayne Cook Associates, Inc. to sell their well servicing units and all other tools and equipment at public auction piecemeal to the highest bidder. Here's a fine chance for you to add that equipment you've been needing or get into business yourself.

EVERY PIECE MUST SELL
TO THE HIGH BIDDER
NO MINIMUM—NO RESERVATION

The sale will include:

1956 HOPPER Model LG with No. 198 double drum spudder attachment. Unit has 6⅝ by 8⅝ double pole telescoping pipe mast and is completely rigged with guy wires, lines, Foster automatic catheads, etc. Unit is mounted on FWD truck and ready to put to work.

1955 HOPPER Model LG with No. 198 double drum spudder attachment. Unit rigged same as the 1956 model above and also mounted on an FWD truck and ready to go.

1954 HILLMAN-KELLY Airtongs and Compressor Equipment mounted on 2-wheel trailer.

2 ALL STEEL tool and dog houses mounted on heavy trailers.

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THE OIL AND GAS JOURNAL,

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October 12, 1959

(This statement is published in compliance with the Act of August 24, 1912).

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The average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was 41,877.

S. H. ROURKE,
Business Manager.

Sworn to and subscribed before me this 30th day of September, 1959.

ROBERT D. FUNK,
Notary Public.

My commission expires April 19, 1963.

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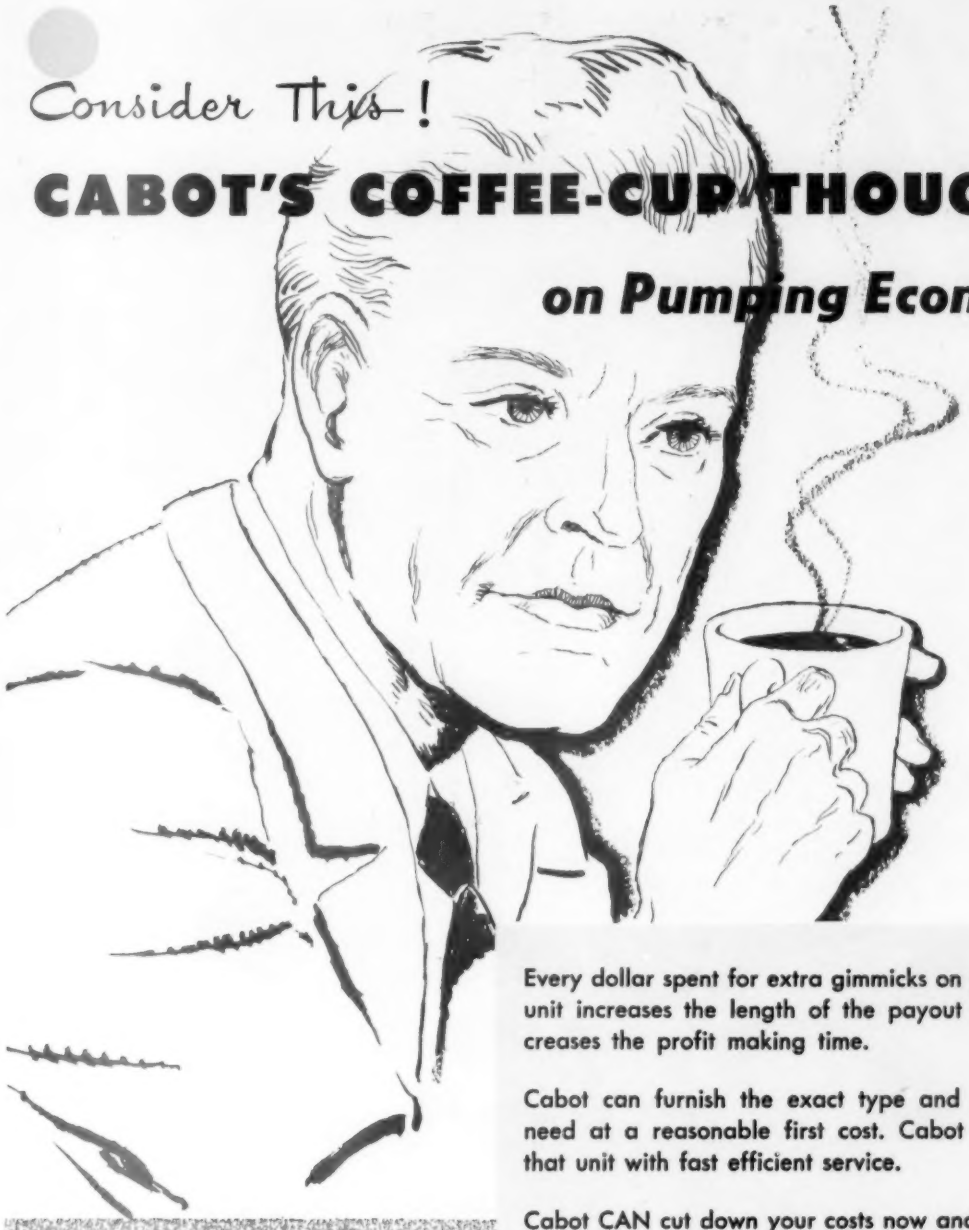

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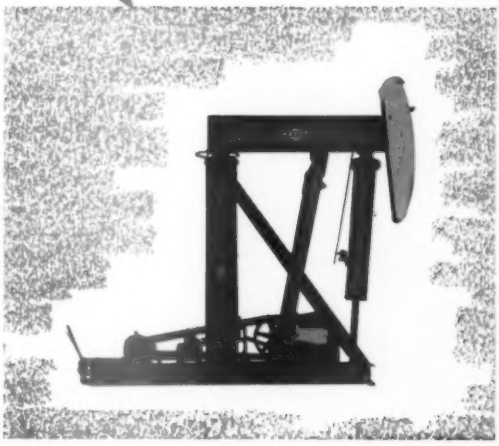

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